

THE PRINCIPLES OF DEDUCTIVE LOGIC

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To

A. C. Mukerji, M.A.,

Professor of Philosophy and Dean of the Faculty of Arts,
University of Allahabad,

My esteemed Teacher of Logic and
Metaphysics,

This work is gratefully and affectionately
dedicated.

PREFACE

The present work lays no claim to originality, unless it be in the method of presentation, which aims at making a somewhat difficult subject both easy and interesting to the beginner. The subject has been introduced in simple language. Suitable examples have been added at every step to clarify the principles. Hints for working out exercises have been given whenever necessary and a large number of exercises have been actually worked out. Each chapter is followed by typical questions selected from the examination papers of the various Indian Universities. Minor and controvertial matters of detail have been avoided in the main body of the work, but these have been introduced in the smaller letterpress to answer the requirements of the teachers and the more intelligent class of students.

Two chapters on *Indian Logic*, dealing with Anumān and Hetvābhās, have also been appended to fulfil the special requirements of the students preparing for the Intermediate examination of the Board of Intermediate and High School Education, U.P.

In writing this volume the author has placed himself under obligation to all the standard writers on the subject whose works he has consulted. He is specially indebted to his esteemed teacher Prof. A. C. Mukerji, Head of the Philosophy Department, University of Allahabad, for his courtesy in reading the manuscript.

May, 1947.

O. B. L. KAPOOR.

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CHAPTER I

INTRODUCTION

1. Man and knowledge.

Man has a natural desire for knowledge. He finds himself surrounded by an infinite variety of objects - the sun, the moon, the stars, the flash of lightning and thunder and the joys of life and its sorrows. They impinge on his consciousness one after another. But they are not simply noted down there as on a photographic plate. They arouse his curiosity. They kindle his desire for knowledge. He is led to ask *what* they are, *why* they are what they are, *how* they come to be and *why* they come to be. He is incessantly asking these questions and will continue to ask them.

Why, we may ask, does he at all seek knowledge? He seeks it in order that he may use it to gain certain ends. But he also seeks it for its own sake. There is something that makes him restless and urges him continually to know more and more. It is this spark of knowledge that distinguishes him from the other animals, and makes him the noblest work of God.

A spark disturbs our clod,
Nearer we hold of God.

—Browning.

2. Knowledge and Truth.

What is knowledge? *Knowledge is a belief in the correspondence of a system of ideas with a system of facts.* It involves three elements, viz., (i) a system of ideas in the

mind, (ii) correspondence of these with a system of facts, and (iii) a belief in such correspondence. For example, the knowledge that there is a beautiful golden temple at Amritsar implies the presence in my mind of a system of ideas such as 'beautiful,' 'golden temple' and 'Amritsar' standing in a particular relation to one another, and a belief in its correspondence with reality.

If we do not have ideas about things, they would not be known at all. In fact, so far as we are concerned, they would be non-existent. But merely to have a system of ideas is not to have knowledge. The ideas must correspond to facts. In reverie or day dreaming we have a chain of ideas in our mind. But these do not correspond to facts. Hence they do not constitute Knowledge. Further the correspondence of a system of ideas with a system of facts does not by itself give rise to knowledge. Knowledge arises only when we come to have a belief in such correspondence. For instance, while I have the idea of a hidden treasure somewhere in my house, such a treasure may actually be there. But I would not know it unless I am convinced that there is correspondence between my idea of it and reality.

There is very little difference between knowledge and *truth*. Truth implies correspondence between ideas and facts. Knowledge implies such correspondence as well as a *belief* in it.

3. Sources of knowledge : Immediate and Mediate knowledge.

How do we know ? What, in other words, are the sources from which we gather our knowledge of the world ? They are Perception, Inference and Testimony or Authority.

Perception gives us direct knowledge. It is either external or internal. It is external when by the exercise of our senses we become aware of the qualities of objects existing outside of us. For example, we see an apple with our eyes and find that it is yellow; we touch it with our hands and find that it is somewhat hard; we smell it with our nose and find that it is fragrant. Perception is internal when by the exercise of our mind or the inner-sense, as it is sometimes called, we become aware of our ideas, feelings and volitions.

Inference (or Reasoning) gives us indirect knowledge. Most of our knowledge is of this kind. By perception we know only the present and the particular. But the distant past and future and the general truths which constitute the sciences cannot be known by perception. Our knowledge of these is derived from inference. The data of inference is supplied by perception. For example, a man dies and after examination of his body we infer that he must have been poisoned; the doctor observes certain symptoms in a patient and infers that he must die; we observe men dying every day and infer that 'All men are mortal.'

Authority or **Testimony** is also an important source of knowledge. Knowledge is based on Authority when we accept a thing on the evidence of reliable persons. A large portion of our knowledge is based on the authority of parents, teachers, authors, experts, books and newspapers.

We may here mention the distinction between **Immediate knowledge** and **Mediate knowledge**. Knowledge which is acquired directly by perception is *Immediate*. Knowledge which is acquired indirectly through the medium of something else is *Mediate*. Inference is

mediate knowledge, because it is acquired indirectly through some medium. For example, when we infer the existence of fire in a house from the sight of smoke rising from its chimney our knowledge of the fire is mediate, because it is obtained indirectly through the medium of smoke. Knowledge derived from Authority or Testimony is also mediate, because it is obtained through the medium of other persons.

Of the three sources of knowledge already mentioned Authority may be resolved into the other two viz., Perception and Inference. We believe a thing on authority, because some people have themselves *seen* it, and because we *infer* from their reliable character that what they say must be true. The other source of knowledge, i. e., perception is not reliable. For the senses do not always give us the correct report about things. For example, to our eyes the sun appears only as big as a football and a stick half dipped in water appears bent near the surface. Thus the real source of knowledge is *thought* or *reasoning*. We think about the impressions of the sun and the stick received through our senses and conclude that the sun is many times bigger than even our earth and the stick is straight though it appears bent. *To know*, in other words, *is to think*. We may see a thing and touch, smell, hear or taste it but we do not really know it until we think; that is, until we relate it to the other parts of our experience and understand its real meaning.

4. Origin of Logic.

Many times, however, we think wrongly. And errors in thinking are injurious. A single error in thinking.

may cost the emperor his empire, the doctor the life of his patient, the lawyer the success of his client, the statesman or the politician his reputation and the businessman all his assets ! The history of human failures in every department of life is largely a history of errors in thinking.

Indeed, what immeasurable treasures of knowledge and happiness would be ours if we could avoid errors in thinking ! Can we not, with this end in view lay down the rules of correct thinking ? Can we not, in other words, by a careful analysis of correct pieces of thinking discover the principles by which such thinking is governed or the conditions which are necessarily fulfilled by it ? We certainly can. Aristotale first attempted it in the west and Kanada and Gautam in the east. The science which thus came into existence was known as *Logic*.

The word 'Logic' is derived from the Greek noun 'Logos' which means 'thought' or 'word as the expression of thought.' This suggests that logic is concerned with the right use of thought and with language as the expression of thought.

EXERCISE I

1. The sources of knowledge are said to be Perception, Inference and Authority. Explain clearly the nature of each, showing the difference between them by means of examples. With which of them is logic mainly concerned ? State your reasons fully. (C. U. 1913)

2. Explain fully the difference between Immediate and Mediate Knowledge. Give illustrations of each. When you go out in the morning and find the roads in a muddy condition, you believe atonce that there has been rain during the night; explain what is immediate and what is mediate—in your knowledge of this subject, giving your reasons (C. U. 1922)

CHAPTER II

DEFINITION OF LOGIC

1. Definition of Logic

Logic may be defined as **the practical science of the principles which direct valid thought in the search after truth.**

What is a Science ? A Science is *a systematic body of knowledge relating to a particular subject.* It differs from ordinary knowledge in the following respects :

(a) Ordinary Knowledge is unlimited in scope. It is co-extensive with almost everything in this world. Every man's ordinary knowledge consists of some knowledge of plants, some knowledge of animal life, some knowledge of matter, some knowledge of human mind, some knowledge of stars and so on. But *the scope of a science is limited to the particular subject it studies.* Thus Biology is the science of life, Psychology is the science of Mind, Zoology is the science of Animal Life, Chemistry is the science of Matter and Astronomy is the science of Stars.

(b) *Scientific knowledge is based on scientific methods and appliances, e. g., telescopes and microscopes, while ordinary knowledge rests on immediate observations made by sense organs without the aid of scientific instruments. Consequently, scientific knowledge is certain and exact while ordinary knowledge is uncertain and inexact.* Compare, for example, an ordinary man's knowledge of the nourishing quality of milk: with a scientist's knowledge of it. The ordinary man knows in a general way that milk is more nourishing than certain other kinds of food. But the scientist knows

exactly what vitamins are contained in it and in what particular proportion.

(c) *Scientific knowledge is systematic* while ordinary knowledge is unsystematic. The ordinary knowledge is a jumble of all sorts of particular facts of experience. The ordinary man makes no attempt to systematise or unify them. Therefore they remain as disconnected and deorganised as ever. But the scientist does not rest satisfied till he has reduced the confused mass of isolated facts of experience into a systematic whole.

(d) But what makes knowledge systematic? The answer to this question will bring out an essential point of difference between common knowledge and science. It may be pointed out that the idea of 'systematic knowledge' presupposes a system or order in the nature of things. For how could our knowledge of things be systematic if the things were not themselves systematic. It no doubt appears at first sight that there is no order in the universe. Things seem to be so dissimilar to each other and events seem to take place without any order or regularity. The whole world seems to be a chaos. But this is only the outward phase of things. Underlying this apparent confusion is a world in which the individual things have a common essential nature and the events take place according to some fixed laws or principles. It is these laws that combine the huge mass of apparently disconnected or isolated facts into a systematic whole. Our knowledge of a particular department of the world becomes systematic when we have discovered the laws by which it is governed. Thus every science aims at discovering laws. The most important

difference between common knowledge and science is that while the former is interested in concrete and individual things, the latter is interested in the general laws by which their nature is governed. Ordinary knowledge is therefore, concrete and particular, while *scientific knowledge is abstract and general*. The ordinary man, for example, is interested in a particular market or the price of a particular commodity at a particular time, but the science of economics is interested in the conditions that determine the prices of commodities in general.

What then is a **Law Or Principle**? *A law is the statement of a general truth*. A general truth is that which holds good universally or in all cases, while a particular truth hold good in some cases only. Thus 'All material bodies attract each other' is a general truth, because it applies to all material bodies whatever, and it is known in physics as the Law of Gravitation. But 'Metals sink in water' is not a general truth because it applies to some cases only.

General truths are not found ready made. They are not observed directly with our senses. They are gathered from particular facts of experience with the help of reason, a faculty specially endowed with the power of abstraction and generalisation. For example, we observe that this hard and green mango is sour and that and that, until at last we lay aside our particulars and say once for all that 'All green and hard mangoes are sour'. Again, on observing in several cases that trees bud in spring, we conclude that 'All trees bud in spring'. Now these general truths form a part of the science of Botany. Similar general truths gathered from particular facts observed about stars form

the science of Astronomy; general truths gathered from particular facts observed about the earth form the science of Geology; while general truths gathered from particular facts observed about correct thinking form the science of Logic.

In every science we *use* thought but in logic we *think about it*, that is, we make a systematic study of the nature of the principles that govern right thinking.

Thought, in the widest sense, means any mental state or phenomenon. In this sense it comprises *thinking, feeling and willing*. But logic is not concerned with thought in this sense, which, truly speaking, is the subject matter of psychology. In another sense 'thought' is used as a synonym for 'knowledge.' In this sense it includes abstract and general thought as well as Perception, Memory and Imagination. Logic is also not concerned with thought in this sense. It is concerned only with *abstract or general thought*.

In logic the word 'thought' is used to denote sometimes the process and sometimes the product of thinking. The processes of thinking are Conceiving, Judging, and Inferring and the corresponding products are Concept, Judgement and Inference or Reasoning.

To *conceive* is to form a general idea in the mind by comparing two or more individual things and finding the attribute or attributes in which they all agree. For example we compare individual men and find that they agree in the attributes of 'animality' and 'rationality.' We collect these under a general idea by a process of *abstraction*, that is, by separating them in our mind from the individual men in which they are found and by fixing our attention upon them to the exclusion of certain other

attributes which are not essential or found in common in all men. The process by which the general idea is formed is called *Conceiving*, while the product of the process, that is, the general idea itself is called the *Concept*. The concept 'man' is, thus, the general idea corresponding to the attributes possessed in common by all individual men. Similarly the concept 'lion' is the general idea corresponding to the attributes possessed in common by all lions, and the concept 'book' is the general idea corresponding to the attributes possessed in common by all books. *A concept expressed in language is called a term.*

To *judge* is to compare two concepts and to recognize a certain relation between them. This involves the act or the process called *judging*. The product of the process is called *judgement*. In the judgement 'Man is mortal' for example, two concepts 'man' and 'mortal' are compared and the relation of agreement is recognised between them. In the judgment 'No men are perfect', the concepts 'man' and 'perfect' are compared and the relation of disagreement is recognised between them. *A judgment expressed in language is called a proposition.*

To *infer* or to *reason* is to pass from one or more judgments to another which may be deduced from them. For example, from the judgment 'Men are mortal', we may pass to the judgment 'No man is immortal.' The process of passing from one judgment to another is called *Inference* or a *Reasoning*, and the product of the whole process is called *Inference* or a *Reasoning*. *When a reasoning is expressed in language it is called an Argument.*

Logic is directly concerned with the product rather than with the processes of thought. But in as much as the processes are revealed in the product, logic also studies the processes. This, in fact, is the only way in which the processes may be studied at all. For the human mind cannot both act and watch the act at one and the same time. The act must pass into the product before it can be made an object of thought.

Thought, like the material object has a two-fold aspect. Every material object has a *form* and is made of

some *matter*. A ring, for example, is round in form and is made of gold, silver or some other metal. A table is round, square or rectangular in form and is made of wood or some other material. Similarly thought has a form and it relates to some matter. The **Form of Thought** is the way in which we think; the **Matter of Thought** is the object thought about. The form of thought may change while the matter remains the same. For example, the propositions 'All men are imperfect,' and 'No men are perfect' are different in form, one being affirmative and the other negative, but their matter or meaning is the same. Again, the matter may change while the form remains the same. For example, the propositions "all men are imperfect" and 'All kings are mortal', are similar in form, that is affirmative, but different in matter.

Truth or Validity also has two aspects. Corresponding to the distinction of form and matter in thought we have the distinction between *formal validity* and *material validity*. In a very narrow sense 'validity' is identified with Formal Validity or Formal Truth. *Formal Truth* means self-consistency or *consistency of thought with itself*. In this sense thought is valid when it is self-consistent. Thus the idea of 'a golden river' is formally true, because it is self-consistent. A golden river may not actually exist, but the ideas of 'golden' and 'river' may yet be put together in thought without any contradiction. The idea of a 'round square' is formally invalid, because it is self-contradictory. We cannot even in our thought combine the idea of 'round' with the idea of 'square'. It is simply unthinkable. **Material Truth** means *consistency of thought with actually existing*. In the wider sense 'validity

both Formal and Material Validity. A valid thought in this sense, is consistent not only with itself but also with things as they actually exist. Thus the idea of 'a snow covered mountain' is valid because it is self-consistent and at the same time consistent with fact. But the ideas of 'golden river', 'green sky' and 'centaur' are invalid, because though formally consistent, they do not agree with facts.

Some logicians think that logic is concerned with formal validity alone. But this too is not correct. For truth is essentially one. Formal truth and material truth are the two aspects of truth and not two different kinds of truth. Logic is concerned with truth in the wider sense that is, with formal as well material truth. The question however requires a fuller discussion and we shall return to it in the chapter on *The Scops of Logic*.

It may be made clear that though logic is concerned with truth it *does not directly aim at discovering truth*. If the aim of logic were to discover truth 'logic would be a name for all the various sciences taken together. But at the same time logic does not take a merely theoretical interest in truth. It actually helps in the discovery of truth by laying down the principles of correct thinking which every science must follow. It is, therefore, a *Practical Science*.

2. Is Logic a Science or an Art ?

There has been much difference of opinion among logicians as to whether logic is a science or an art. *Aldrich* and *Minto* call it an art. *Mansel* and *Thomson* think that it is a science, while *Whately* and *Mill* think it is both a science and an art. A satisfactory answer to the question

may be found, if we first consider the distinction between Science and Art. A Science is a systematic body of principles explaining a particular subject-matter, while an Art is a body of rules for attaining a certain end and implies some *practical skill* acquired from experience in the application of those rules. Thus Physics is the science of the principles or laws, which govern physical matter, while Surgery is the art of healing by manual operation guided by definite rules for the realisation of that end. Science is *theoretical* while art is *practical*. A Science teaches us *to know* and an art *to do*. A science is acquired by *study* and an art by *practice* or partly by study and partly by practice. The former teaches that something exists and sets forth the laws which explain its nature and existence, while the latter teaches how something must be produced. Thus science *explains* while art *creates*. "The language of Science is: This is or This is not; This does or does not happen. The language of Art is: Do this, Avoid that" (J. S. Mill).

But it is difficult to draw a clear line of demarcation between Science and Art. They usually go hand in hand. Every science is applied to life and thus becomes an art. A science which has no practical influence on human conduct perhaps does not exist. On the other hand every Art to be certain and precise in its results must be based on science. As Whewell says, "The principle which art *involves*, science *evolves*." (Inductive Science, II, p. III.) For example, Medicine as the art of healing is more successful in the hands of a qualified doctor, whose knowledge of the rules of healing is founded on the sciences of Chemistry, Physiology and Anatomy than in the hands

to which we ought to think. The laws of a positive science cannot be broken, while those of a normative science can be broken.

4. Normative Science and Art.

A Normative Science is obviously distinct from an Art. For a Normative Science *defines* an ideal, while an Art lays down *rules* for its attainment. A Normative Science is *theoretical* while an Art is *practical*. Logic is a normative science as well as an art, because it not only defines the ideal of Truth but also lays down rules for its attainment. But Ethics and Aesthetics are not arts, because they do not formulate any rules for the ideals of Goodness and Beauty, which they seek to define.

5. Some Definitions of Logic Considerd.

I. *Logic is the Art of Reasonings.*

(a) This definition recognises only the practical aspect of logic. It ignores its real character as a science.

(b) It is *too narrow*. The term 'reasoning' is restricted in meaning. It does not apply to Division, and Classification etc., which are also dealt with in logic.

II. *Logic is the Science of the Laws of Thought.*

—Thomson.

(a) This definition ignores the practical aspect of logic. Logic is no doubt a science, but its interest in thought is not purely theoretical. It also lays down rules for the attainment of valid thinking.

(b) The word 'thought' is misleading. It has a wider meaning and a narrower meaning. In the wider sense it includes Perception, Memory, Imagination as well as abstract and General Thought. Interpreted in this sense

the definition is *too wide*. Logic is concerned only with abstract and general thought.

(c) Again, Logic is not concerned with thought as such, which forms the proper subject matter of Psychology. It is concerned with valid thought, or thoughts which helps in the discovery of Truth.

III. *Logic is "the Science of the Formal laws of Thought."*

This definition lies open to all the objections made against Thomson's definition above.

Besides, it restricts the scope of logic to formal truth, thus identifying it with Formal Logic. But logic is also concerned with material truth and what is known as Material Logic forms an integral part of it.

IV. *Logic is the Science of the Regulative laws of human knowledge. (Ueberweg)*

This definition is *too wide*. The term 'knowledge' is very comprehensive. It includes inference as well as perception, memory and imagination, while logic is concerned with inference only.

V. *Logic is the science of the principles which regulate valid thought. (Welton)*

This definition is very nearly correct. It states that logic is a science. It also recognizes the practical nature of the science of logic by emphasising that the principles of correct thinking which it lays down "regulate" or guide valid thought in the discovery of truth. The word 'valid' implies both formal and material validity and thus includes both formal and material logic. 'Thought' implies both inferential and non-inferential processes of

thinking and thus includes Definition, Division, Terms and Proposition etc. But 'thought' has a wider sense in which it includes perception, memory and imagination with which logic is not concerned, because they do not lead us to the discovery of truth.

EXERCISE II

1. "To study logic is to think about thought in order to distinguish between correct or valid and incorrect or invalid thought."

Explain this definition fully and give examples to illustrate your answer. (U. P. B. 1926)

2. Give and explain the definition of Logic which appears to you to be the most satisfactory. (C. U. 1928)

3. Give a suitable definition of Logic. Explain your definition thoroughly and in the light of the same criticise the following:—

(a) Logic is the Art of Reasoning.

(b) Logic is the science of thought.

(c) Logic is the science not of Truth but of consistency.

4. Distinguish between a Science and an Art. Is Logic a Science or an Art? (C. U. 1923)

5. Logic has been called the 'science of sciences,' what do you understand by this? Why should you read logic? (P. U. 1932).

6. What do you mean by a science? How does scientific knowledge differ from ordinary Knowledge? What claim has logic to be considered a science?

7. Explain why Logic has been called the Science of Sciences and Art of Arts. (C. U. 1909). Distinguish between Positive and Normative Science. Is Logic a Positive Science or a Normative Science

CHAPTER III

SCOPE AND UTILITY OF LOGIC

1. The Scope of Logic.

We have described logic as the science of sciences, and every other science as a special application of the principles of logic to a particular field of Knowledge. In this sense logic is co-extensive with all other sciences. This fact is also borne out by the names of sciences, e.g., biology, geology, psychology, physiology, entomology, minerology, theology, ecclesiology, morphology. In these words 'logy' really means 'logic,' so that geology is equivalent to logic applied to explain the formation of the earth's crust, psychology is equivalent to logic applied to the nature of the mind, and so on. But though the reasonings of all sciences come within the scope of logic, it is not in any way concerned with their materials. By the scope or province of a science we understand the subject matter it studies or the limits within which it carries on its investigations. The subject matter which logic studies is 'valid thinking,' which, therefore, constitutes the proper scope or province of logic.

2. Is Logic concerned with Formal Validity or Material Validity ?

Validity, we have seen, is Formal as well as Material. The question is whether logic is concerned with Formal Validity alone or with both Formal and Material Validity.

Formal logicians led by Kant, Hamilton, Mansel and Thomson hold the view that logic is concerned only with Formal Validity. Logic, they say is, "Science, not of Truth, but of consistency"* or the "Science of the Formal Laws of Thought."

But this view is too narrow. Truth in the real sense means not only the consistency of thought with itself but with things. A thought is not completely true unless it is both formally and materially consistent. The reasoning, for example,

All men walk on their heads,
John is a man,

Therefore John walks on his head,
though consistent with itself it is not consistent with facts.
Again, the reasoning

Some Indians are patriots,
Mahatma Gandhi is an Indian,

Therefore Mahatma Gandhi is a patriot,
is false; for, though its constituent propositions agree with facts, it is not self-consistent. The conclusion is not correctly drawn from the premises, that is, it is not drawn according to the rules of this form of reasoning. "Some Indians are patriots" is a particular proposition; it holds true of *some* Indians only, and therefore it does not warrant the conclusion that Mahatma Gandhi is a patriot just because he is an Indian. But the reasoning

* The word 'Truth' is here used to mean 'material truth' only and the word 'consistency' is used to mean 'formal consistency' only.

All men are imperfect,
All kings are men,

Therefore All kings are imperfect,
is truly or logically valid, because it is valid both formally and materially.

The view of formal logicians is based on the wrong assumption that the form of thought can be separated from its matter. As a matter of fact, the two are inseparable. A form without some material or a thought without some object to which it refers is meaningless. A thought is always the thought of some *thing*. There is no such thing as a thought *in vacuo*. As Kant said, *Matter without form is blind and form without matter is empty*.

Moreover, *form and matter affect each other*. The form is modified according to the matter of thought, because we think of different kinds of objects in different ways. Even "the most general forms of thought exist diversely modified in thinking about different matter,"* and similarly, matters are diversely modified when they are expressed in different forms of thought.

Logic, therefore, does not study the forms of thought by themselves, but as expressed in different kinds of matter. "Not merely logic, but all the other sciences investigate the form of their phenomena, that which remains the same in a great variety of instances. But they study the form *in* the phenomena, and not *apart from* it. Physics, for instance, studies the forms, the universal laws or principles, of such phenomena as electricity, light and gravity, which appear in countless instances. But it would be manifestly absurd to

* Joseph, Introduction to Logic, p. 4.

say that it studies these forms or principles without taking into account the phenomena, the matter, the instances in which the laws appear Just as physics studies the form of electricity as it appears in various instances, so logic studies the form of thought as it appears in various instances".*

But "Just as Physics is interested in particular Phenomena not merely in themselves but for the sake of the laws or principles which they exhibit, so logic is concerned with the matter of thought, not on account of its intrinsic interest, but solely because of the forms of thinking which appear in various objects of thought." †

Logic is thus primarily concerned with form and secondarily with matter.

3. Formal And Material Logic.

Form and matter of thought, it has been already explained are distinguishable but not separable. Corresponding to this distinction we have the distinction between Formal Logic and Material logic. Formal logic aims at formal consistency and Material logic aims at material consistency. The former is called Deductive while the latter is called Inductive. In Deductive logic our reasonings need not be materially true. It is sufficient if they are self-consistent. The premises may or may not agree with facts but the conclusions must be drawn from them strictly according to rules. The truth of purely deductive reasonings is, therefore hypothetical in nature. They imply that if certain propositions be true then certain other propositions which follow

* Latta and Macbeth, *The Elements of logic*, p. 8.

† Latta and Macbeth, *op. cit.*, p. 8.

form them as conclusions from premises must also be true. But in inductive logic our reasonings must be materially true.

4. Parts of Logic.

We have seen that logic is mainly concerned with reasonings. But since the reasoning is built upon the proposition and the proposition upon the term, logic naturally divides itself into three parts.

The First Part deals with the Term;

The Second Part deals with the Proposition;

The Third Part deals with the Reasoning or Inference.

Some Logicians add to these a fourth part, called the Method, which deals with the orderly arrangement of inferences in an essay or discourse, with a view to secure scientific knowledge. Modern logicians usually state in brief the rules and canons pertaining to method and leave the fuller discussion of these to an allied science called *Criteriology* or *Epistenology*.

It should, however, be noted that this division does not imply an artificial or mechanical connection between term, proposition and reasoning. It is based on the assumption that three different moments can be distinguished in every single act of thought, which in its true nature is unique and unanalyseable.*

* "As a matter of fact no one will ever succeed in thinking a concept, a real concept, which is not at the same time a judgment, i. e., an assertion of its own essence; nor can anyone find a concept or a judgment, which is not at the same time, a conclusion, being connected in a system with other conceptions and judgments." (Croce's article in *Encyclopaedia of the Philosophical sciences*. Vol. I, Logic (Macmillan) p. 200)

5. Is logic concerned with thoughts or with words or with things ? Conceptualism, Nominalism, and Realism.

What exactly is the nature of the phenomenon which logic deals with ? Three different views are held on this question, viz , Conceptualism, Nominalism and Realism.

Conceptualism is the view according to which a proposition is the expression of relation between two ideas and *logic is the science of "the pure or formal laws of thought."* It is identical with Formal logic and excludes Material or Inductive Logic. This view is supported by Hamilton, Mansel and Thomson.

Nominalism is the view according to which *logic deals with consistency in words or language*, a proposition being the expression of a relation between two words or names or terms. This school is represented by Whately. It is considered probable, however, that when Whately declared language to be the object matter of logic, he did not mean anything more than that reasoning is not possible without the use of language.

Realism, is the view according to which *logic deals with consistency between things*, and a proposition is the expression of a relation between things and attributes as they actually exist. This view is also known as Phenomenalism or Objectivism. It is represented by Mill.

Now the thoughts, words and things cannot truly speaking be separated from one another. Thoughts have a necessary reference to things and cannot be expressed except through the medium of words ; words apart from ideas which they express are meaningless jargons ; and things apart from thoughts cannot be known. Logic, therefore, cannot treat of any one of these in isolation from the others. In a sense, it is true that it treats of all the three. *It is no doubt primarily concerned with thought, but in as much as thoughts are expressed in language and have reference to things, it is also concerned with words and things.*

6. Is Logic concerned with Language ? Relation between Logic and Grammar.

Language is the medium through which thought is expressed. Without this medium we shall never know each other's

thoughts. Some psychologists have held the view that thought is not at all possible without the aid of language. The Behaviourists, following Watson, identify thought with speech. According to them thought is inner or silent speech. In thinking we are speaking within ourselves. Whether thought without language is possible or not, it is certain that *language gives clearness and definiteness to our ideas*. Without language thought would be so vague and indefinite that it would hardly serve the purpose of science. *Language helps the formation of ideas or concepts*. It shortens the processes of thought by supplying simple words for complex mental states. For instance, the words 'Communism,' 'Fascism,' 'Science' 'Religion' etc. contain a whole mass of ideas. These facilitate thought just as symbols in Algebra facilitate calculation. Language is necessary not only for the formation of ideas but also for their retention and reproduction. It is not possible to remember things without the aid of language.

Language, likewise, depends on thought. It has no significance without thought. Any word or combination of words which does not represent an idea or thought is a meaningless sound. *Thought is the essence of language*. Language without thought is like body without soul.

Thought and Language are, thus, inseparable. The intimate connection between thought and language has led some logicians to confuse Logic, the science of thought, with Grammar, the science of language. Whately, for instance, mentions verbal consistency as the sole aim of Logic. But though Logic and Grammar are both concerned with language, the two sciences are quite distinct. Logic is primarily concerned with thought and secondarily

with language. *It deals with language only as an instrument of thought.* But Grammar is primarily concerned with language. *The main function of Logic is to see that our thoughts are consistent. The main function of Grammar is to see that they are clearly and accurately expressed.* Grammar is not concerned with the consistency or inconsistency of our statements so long as they are intelligible.

7. Logic and Psychology.

There are several kinds of mental activity, of which the most important are *Knowing, Feeling* and *Willing*. For instance, I see the examination result of my friend in the newspaper; I come to *know* that he has passed; I *feel* delighted and I resolve or *will* to write to congratulate him. Psychology deals with all these various kinds of mental processes. But logic is concerned with only one i. e., knowing. Thus *Psychology is much wider in scope than Logic.*

Again, knowledge is either mediate or immediate general or individual and concrete or abstract. *Psychology deals with all kinds of knowledge, while Logic is concerned with mediate, abstract and general knowledge only.*

Psychology explains all mental phenomena as they actually occur. It is a descriptive or *positive* science. Logic lays down rules for valid thinking. It does not, tell us how we *do* think, but how we *ought* to think. It is a *normative* or *regulative* science. Logic is concerned with correct thinking only but psychology is equally interested in both correct and incorrect thinking.

Psychology deals with mental processes as they actually occur i. e., the processes of Conception, Judgment and Reasoning, while Logic deals with the products of thinking, i. e., Concepts, Judgments and Reasonings.

It is clear from the above that Logic and Psychology operate in distinct fields of knowledge. But they are also interdependent. The task of Logic, which consists in finding out the regulative principles of valid thinking is very much facilitated by a correct understanding of the way in which we actually think, which Psychology makes possible. Psychology on the other hand depends on Logic for a systematic investigation of its data.

8. Logic and Metaphysics.

Metaphysics is the science of ultimate Reality. It is quite distinct from the other sciences. These deal with things as they appear to us. But Metaphysics deals with the things as they actually are, i. e. with the reality as such. Every science is based on certain assumptions. Chemistry, for instance, takes for granted the existence of matter, Psychology presupposes the existence of mind, and Geometry the existence of space. Metaphysics undertakes to study the nature of these presuppositions. It enquires whether mind, matter, and space etc. really *exist* or they simply appear. Thus every science ultimately depends on Metaphysics.

In Logic we presuppose the form and matter of thought i. e., the laws according to which we think and the matter which we think about. Metaphysics enquires whether the laws of thought are ultimately true and whether the objects to which they refer really exist. Thus Logic, like any other science rests upon Metaphysics.

But Metaphysics depends on Logic in as much as in all its investigations it must make use of thinking and be

mistake, but *explain* it by pointing out the principles of correct thinking which it violates, while the ordinary man, even if he knows the reasoning to be wrong, may not be able to do more than clench his teeth and shout repeatedly that it is so.

Another use of the study of logic lies in the fact that *it involves a good mental discipline*. Of the two ends of education, *forming* the mind and *informing* it, the former is certainly more important and a careful study of logic contributes to it more than anything else. The subject matter of logic being abstract it involves a greater strain on the mind and affords better exercise to it than any other science. It thus develops the power of the intellect which may be used with advantage in any department of life.

Further logic lays down an ideal method of discovery and proof to be followed by all* other sciences. "Within every special science, whether worked out by itself or not, lies a method, and hence a fragment of logic" (Windleband). In this sense logic *may be regarded as a prolegomena to other sciences*.

Logic also *has immense value as an art of persuasion*. In our daily life we are required to convince other people of our beliefs and opinions. This we do sometimes by appealing to their sentiments. But this kind of persuasion is neither wholesome nor abiding. Only the logical form of persuasion or persuasion based on sound and clear reasoning is really successful.

Lastly, if we admit with Sir W. Hamilton, as we must, that

* Logic for this reason is sometimes called Methodology.

"In the world there is nothing but man.

In man there is nothing great but mind,"

shall we not say that logic, irrespective of any practical advantages, resulting from it, *is itself a subject worthy of study?*

EXERCISE III

1. Explain and examine the following statement "Logic is concerned with the *Validity* (i. e. formal truth) not with truth (i. e. material truth) (U. P. B. 1930).

2. Distinguish between Formal and Material Truth Which of them constitutes the proper subject matter of logic.

3. Logic has been defined as the Science of the Formal Laws of thought? Explain what is meant by *Thought* and *Formal Laws of Thought* Do you Consider this definition adequate? If not substitute what you consider to be a better one giving your reasons. (U. P. B. 1928)

4. Logic has been called the 'science Of sciences' What do you understand by this? Why should you read Logic. (U. P. B. 1932).

5. Define the scope of Logic and mark it off clearly from that of (a) Psychology and (b) Grammar (U. P. B. 1920).

6. Discuss the scope of Logic. What practical value may be attributed to Formal Logic (i) in the detection of errors (ii) in the discovery of Truth? (U. P. B. 1932)

7. How would you describe the purpose of the science of Logic, as the 'checking of errors' or 'the attainment of truth'? How can you say that Logic is a necessary aid in correct thinking: Considering that many people who have never studied Logic reason correctly are not a few who have studied it reasod thoroughly badly (U. P. B. 1933).

8. Distinguish Logic carefully from Psychology on one side and Mataphysics on the other. (U. P. B. 1932).

9. Point out the uses of the study of Logic. Does it render a man free from error? (C. U. 1923).

10. What are the uses of Logic (C. U. 1928).

11. Can you say that the study of The Logic is useful when persons who have never studied it reason accurately? Give reasons for your answer. (G. U. 1914).

CHAPTER IV

THE LAWS OF THOUGHT

1. The Laws of Thought.

We have seen that the primary function of logic is to discover the principles of correct thinking, or the laws according to which thought must be carried on in order that it may be valid. Many such laws are gradually brought to light by a patient and careful analysis of valid thought. But all these are reducible to three fundamental laws. They are regarded as the foundation of logic, and are usually set forth at the very beginning of logical enquiry as axioms or assumptions that require no proof. They are variously named as *The Laws of Thought*; *The Fundamental Laws of Thought*; *Regulative Principles of Thought*; *Formal Laws of Thought*; *Fundamental Principles of Deductive Logic*; *Postulates of Knowledge*; *Axioms of Inference*.

The three Fundamental Laws of Thought are :—

- (1) The Law of Identity,
- (2) The Law of Contradiction, and
- (3) The Law of Excluded Middle.

2. The Law of Identity.

The *Law of Identity* states the simple truth that 'Every thing is identical with itself,' or 'Every thing is what it is' (Leibniz). A is A; gold is gold; brass is brass; Churchill is Churchill; Mahatma Gandhi is Mahatma Gandhi. Stated in this way the law appears to be either tautologous or meaningless. But the usual form in which it is expressed

obscures its real meaning. It does not mean that there is no change and things always remain exactly the same. This will be contrary to all experience. Things do not only change, but they change from day to day, and from moment to moment. As Heraclitus, an ancient Greek philosopher said, the world is like a river of which no part remains the same even for a moment. The law really means that every thing changes, but nothing changes altogether. *Every thing has an essential nature or a permanent character, which remains the same.* A person changes from day to day and from year to year, but he also remains identical with himself. I am the same person today as I was when I was a child, and shall remain the same when I grow old and my hair turn grey and my teeth fall off. I cannot change absolutely so as to become other than myself. I cannot pass now into this and now into that at *random*. I cannot become now an angel, now an insect and now a star or a planet. My essential nature remains the same; though in other respects I change. Thus the principle of identity or 'A is A' cannot be interpreted to mean a bare identity but *identity in difference* or continuity in change. If things did not continue to be the same in the midst of change knowledge would be impossible. Before our knowledge of a thing was complete it would have changed. There would be no distinction between truth and error. What is true at one moment would be false at another. We could not make a true statement about anything. Before we could say the last word about it it would have changed.

The above is the general meaning of the principle of identity. Its strictly logical implication is that *the data of a reasoning or an argument are absolutely fixed.* A term

must not be used in two or more different senses in the same reasoning. In the reasoning 'No man is made of paper; All pages are men; therefore, no pages are made of paper,' the term 'pages' occurs twice. It is an ambiguous term and may be intended to mean either 'boy servants' or 'the pages of a book.' Now the reasoning is correct if the term means the something (i.e. boy servant) in both the propositions, but incorrect, if it means one thing (boy servant) in the premise and another (the page of a book) in the conclusion.

From the Principle of Identity there follows another Axiom which Hamilton calls "The Postulate of Logic." Hamilton states the postulate thus: "Before dealing with a judgment or reasoning expressed in language, the import of its terms should be fully understood; in other words, *logic postulates to be allowed to state explicitly in language all that is implicitly contained in thought.*" The meaning of the postulate is that logic is concerned with thoughts and not with the language or the form in which they are expressed. Therefore the thought underlying a reasoning should be carefully understood, and if the language in which it is expressed does not make it quite clear it may be changed. The change in the form of expression does not make any difference to logic, so long as the meaning remains the same *viz.*, so long as the thought expressed in one is identical with the thought expressed in another.

The *Principle of Similarity* on which all inference is based is also but an aspect of the Principle of Identity. For similarity is due to the identity of some quality. As Aristotle says 'Similarity is unity in some quality, while identity is unity of essence' (Metaphysics, IV, 15, 1.)¹

¹The Equational or Symbolic Logic of Boole and Jevons is based on this interpretation of the Principle of Identity. According to these writers Judgment affirms the entire identity of the subject and, the

3. The Law of Contradiction :

The Principle of Contradiction asserts that **the same thing cannot have two contradictory attributes, or, A cannot be both B and not B.** If A is B, it cannot, at the same time be B. A leaf cannot, at the same time, be both green and not green; a sample of water cannot, at the same time, be both liquid and not-liquid; a man cannot, at the same time, be both good and not good. Two contradictory qualities cannot together be true of the same subject, *viz. one must be false.*

The law has been stated in various other forms, for example, 'The same attribute cannot be at the same time affirmed and denied of the same subject.' (Aristotle); 'Judgments opposed contradictorily to each other (as 'A is B' and 'A is not B') cannot both be true' (Uberweg), 'what is contradictory is unthinkable' (Hamilton).

It is obvious that the law refers to one and *the same object in exactly the same circumstances.* It does not refer to different parts or aspects of the same thing or to the same thing at

predicate. It is in the form $A = A$, and an argument may easily be worked out by the equational method. Take, for example, the argument,

All metals are elements,

Iron is a metal;

Therefore iron is an element.

If metal is represented by M, iron by I and element by E, then the argument in equational form stands as

$$M = E \quad \dots \dots \dots (1)$$

$$I = M \quad \dots \dots \dots (2)$$

and by substituting in (1) the value of M in (2) we get the required conclusion $I = E$. Jevons calls this method the Substitution of similars, which according to him is the fundamental principle of all reasoning.

But the view that judgment affirms the entire identity of the subject and predicate refutes itself. For "either there is some difference between the subject and the predicate and the judgment is, therefore, not in the form $a = a$, or the judgment is tautologous and expresses nothing." (Creighton, Introductory Logic, p. 348).

different times. For the same object may have one quality in one part or at one moment of time and its contradictory quality in another part or at another moment of time. The same bar of iron may be hot at one end and not hot at the other; while the same person may be good at one time and not good at another.

The principle has been more appropriately called the **Law of Non-contradiction**, because it is essentially negative in form.

4. The Law of Excluded Middle

The Principle of Excluded Middle states '**Everything is either a given thing or its contradictory.**' '**As is either B or not—B.**' Two contradictory qualities *cannot both be false* of one and the same thing at the same time and in the same sense, that is, *one must be true*, and the absence of one necessarily implies the presence of the other. For instance, 'whiteness' and 'non-whiteness' cannot both be false of a piece of it paper; must be either white or non-white. If it is not *white* it must be *non-white*. If it is not *non-white*, it must be *white*. There is no middle course possible.

Other forms in which the law is expressed are: Everything must either be or not be (Jevons); Either a given judgment must be true or its contradictory, there is no middle course (Thomson); Of two contradictories one must exist in any object.

The law refers to contradictory terms because they are *exhaustive*. Between the two contradictory terms 'black' and 'not black,' there are no other alternatives possible. A thing must be either 'black' or 'not-black.' It does not apply to *contrary* terms, because they are not

exhaustive. Between the two contrary terms 'white' and 'black' there are many other alternatives possible. A thing need not be either 'black' or 'not-black' it may be blue or green or any other colour.

Überweg's Principle of Contradictory Disjunction combines both the Law of Contradiction and the Law of Excluded Middle. The formula of this principle is:—'A is either B or not-B' which means that 'A cannot be both 'B' and 'not-B' (Law of Contradiction), and that it must be *one* or the *other* (Law of Excluded Middle).

5. Interrelation of the Laws of Thought.

The three Laws of Thought can never be isolated. They emphasise but different aspects of the same truth. The Law of Identity states 'A is A'; the Law of contradiction states the same thing negatively, 'A is not not-A.' Thus the *Law of Contradiction is a negative form of the Law of Identity*. The former necessarily implies the latter, because identity is not possible without the absence of contradiction. Removal of contradiction is a necessary means to the attainment of identity or consistency. A is A, because it is not at the same time not-A. It is identical with itself because it is not other than itself. The law of Excluded Middle, we have seen, is complementary to the Law of Contradiction. It emphasises a different aspect of contradiction. It implies that the contradictories are totally exhaustive, *i.e.*, they leave no possibility of a middle course, while the Law of Contradiction implies that the contradictories are *mutually exclusive*.

6. Aristotle's Dictum.

Some logicians think that Aristotle's *Dictum de omni et nullo*; which is the basis of all syllogistic reasoning, should

also be regarded as a fundamental law of thought. The dictum or the principle may be stated thus:—

“Whatever is predicated whether affirmatively or negatively, of a term distributed, may be predicated, in the like manner, of everything contained under it.”

But this dictum may be deduced from the three laws of thought given above. The canons of syllogism as laid down by other logicians like Lambert and Thomson may also be deduced from these.

7. The Law of Sufficient Reason.

To the three fundamental laws of thought, logicians, following Lambert, often add a fourth, called the Law of Sufficient Reason. The Principle is stated thus: “*For everything there is a sufficient reason why it is so rather than otherwise.*” It has a two fold meaning:—

(a) As applied to judgments or propositions, it means that *for every proposition which is held to be true there must be sufficient reason for regarding it so.* It must be capable of being proved by showing that it follows as a necessary conclusion from certain propositions taken as premises. For example, when we say, ‘Mahatma Gandhi is imperfect’ there must be sufficient reason for making this statement. The reason may be provided by showing how this proposition follows as a conclusion from certain premises:—

All men are imperfect;

Mahatma Gandhi is a man;

∴ Mahatma Gandhi is imperfect.

Thus, according to the Principle of Sufficient Reason every judgment when questioned expands into an *inference*.¹

¹ This does not apply to the Laws of Thought, because they do not require any proof.

(b) As applied to events in nature it means that for every event that happens there must be a cause or a reason. It is, therefore, sometimes stated thus: "*Nothing happens without a cause or reason*;" "Every event has a cause;" "Nothing can come out of vacuity or stillness;" "Nothing can be uncaused." There is no chance happening. Every event is connected with every other event. There is an order or regularity in the course of nature and things do not happen in a hap-hazard manner. The Principle of Sufficient Reason thus includes (1) The Universal Law of Causation and (2) The Law of Uniformity of Nature, which form an important part of Inductive Logic.

8. General Nature of the Laws of Thought.

The Laws of Thought are *necessary* principles, for they cannot consciously be violated. Their violation is always unconscious and due to some such reason as the ambiguity of language or carelessness of thought. The Law of contradiction, for example, may be violated unconsciously, but we cannot consciously think a contradiction or say that A is both B and not-B.

They are *regulative* principles. They are not statements of how we *do* think or *must* think, but how we *ought* to think. In this respect they are different from the laws of nature or the laws of state.

They are *a priori* i.e., prior to all experience. They are not derived from experience like the laws of nature, but experience is made possible by them. They are the grounds of experience.

They are *formal*, i.e., they are the universal forms or patterns, which all our thoughts must necessarily adopt,

whatever be the things we think about. In other words, they are independent of the matter of thought.

They are *fundamental* because they lie at the foundation of all knowledge. They cannot be proved because proof is not possible without them.

EXERCISE IV

1. Enunciate the primary Laws of Thought and show how these laws differ from the laws of nature and the laws of state. (U.P.B. 1931).

2. What do you understand by a Law of Thought? State and explain the meaning of the fundamental laws of thought. Do they supply a criterion or test of truth? If so, in what sense? (P.U. 1924).

3. What are the Laws of Thought? Explain the nature of the laws of Contradiction and Excluded Middle. Give concrete examples of each and point out their distinctive functions (U.P.B. 1937).

4. What do you understand by the Principle of Sufficient Reason? Indicate its importance in Logic. (C.U. 1920).

5. Examine the question whether the Principle of Identity is a tautology. (C.U.)

6. State and explain the principles of Identity, Contradiction, and Excluded Middle as Fundamental Laws of Thought. Discuss how they are related to each other.

CHAPTER V

TERMS

1. The Necessity Of Studying Terms

Logic is primarily concerned with reasoning or inference. Inference is composed of propositions. For example, the reasoning.

All men are mortal ;

All kings are men ;

Therefore all kings are mortal.

is composed of three propositions. Each proposition is composed of two terms, the Subject and the Predicate. The subject is that of which something is affirmed or denied. The predicate is that which is affirmed or denied of the subject. In the proposition "All men are mortal" "Men" is the subject and "Mortal" is the predicate. To understand the character of inference it is necessary to understand the character of terms. The logical value of arguments depends on the proper use of terms. If a reasoning contains terms which are ambiguous or indefinite in meaning it is likely to be wrong. Hence the study of terms must form an important part of logic.

2. The Meaning of Term.

In a narrow sense a term is a word or group of words which is actually used as the subject or the predicate of a proposition. But , in the real sense **a term is a word or collection of words which may by itself be used**

as the subject or the predicate of a proposition.

It is so called because it occurs at the *terminus* or boundary of a logical proposition. A logical proposition consists of three parts—the *Subject*, the *Predicate* and the *Copula*. The *Copula* is the sign of connection between the subject and the predicate. The subject and the predicate stand at the two ends of a proposition, while the *Copula* stands in the middle. For example, in the proposition 'Man is mortal' 'man,' the subject stands at one end, 'mortal' the predicate stands at the other end, and 'is', the copula comes in the middle. In this proposition 'man' and 'mortal' are terms because they have been actually used as the subject and the predicate of the proposition. But words may not be actually used as the subject or the predicate of a proposition, and yet they would be regarded as terms if they are capable of being so used by themselves. Thus 'virtuous' and 'a dangerous thing' are terms because though they are here taken in isolation, they are capable of being used by themselves as the subject or the predicate, as for example, in the propositions: "The *virtuous* are happy" and "Little learning is *a dangerous thing*." Such words as 'the' 'of' 'and' 'is' cannot by themselves be used as the subject or the predicate and hence they are not terms.

3. Term and Word.

A word is a letter or a combination of letters conveying some meaning, e.g., a, I, man, round etc. It is just a sign or a symbol by means of which we communicate with one another. *All words are not terms though all terms are words.* Only those words are terms which can by themselves be used as the subject or the predicate of a proposition. Such

words are called *Categorematic*. Words which cannot by themselves be used as the subject or the predicate of a proposition are called *Syncategorematic*. Articles, adverbs, prepositions, conjunctions, and interjections are *syncategorematic*.* Thus *Categorematic* words are terms while *syncategorematic* words are not terms.

Syncategorematic words can be used as terms in conjunction with other words for example : *The* (article) *smell of* (preposition) *rose* is sweet. But there are some words which cannot be used as the subject or the predicate of a proposition even in conjunction with other words, e.g., interjections. Such words are called *acategorematic*.

A proposition may consist of several words, but it cannot have more than two terms.

A term may consist of one word or a number of words. In the proposition 'The man who spoke first at the meeting in the townhall yesterday is a fine speaker,' the subject consists of a dozen words. Some times a single word may stand for both the subject and the predicate, e.g., 'Fire !' The word really means "The house (or something else) has caught fire" and is equivalent to two terms.

A word sometimes has several meanings. But a term cannot have more than one meaning. A word in this sense is equivalent to as many terms as it has meanings.

4. Term and Name.

Name is a word or a collection of words used to express our idea of a thing. It is a word regarded merely as having a

* It may be pointed out that in such propositions as—'Of' is a preposition, or 'And' is a conjunction, 'Of' and 'and' are terms but in these propositions 'of' and 'and' are used as substantives and not as preposition or conjunction.

meaning. But a term is a word regarded as the possible subject or predicate of a proposition. Thus the same word might be regarded as a name or as a term according as it is looked upon as simply having a meaning, as in the dictionary, or as the possible subject or predicate of a proposition. As a name a word may have more than one meaning but as a term it can have only one meaning. When a name has more than one meaning it stands for more than one term.

5. Term and Concept.

Concept means the general idea of the essential attributes possessed in common by a class. A concept expressed in language is called a Term. For example, the concept of *man* is a general idea of the essential qualities possessed in common by individual men, while the same general idea expressed in language as "man" is a term. All concepts when expressed in language are terms; but all terms are not expressions of concepts. For some terms are the expressions of particular ideas and some are the expressions of general ideas.

6. Denotation (or Extention) and Connotation (or Intention) of Terms.

Most terms have two kinds of meaning : (a) meaning in Denotation and (b) meaning in Connotation. Denotation implies the number of objects to which the term can be applied in the same sense. Connotation implies the essential qualities possessed in common by the objects to which the term applies. The denotation of the term 'man' consists of the particular persons, Ram, Shyam, Tom, John, etc., to whom the term applies ; while its connotation

consists of the essential qualities of animality and rationality possessed in common by men. Denotation denotes things or individual objects. Connotation connotes *attributes* or qualities. Denotation answers the question *which?* Connotation answers the question *what?* The answer to the question 'which are men?' is 'Ram, Shyam, etc.' the answer to the question 'what are men?' 'is those that possess the attributes of animality and rationality.'

7. Various Meanings of Connotation : Subjective Connotation Objective Connotation and Conventional Connotation.

The term 'Connotation' may be used in various senses. It may be used to mean Subjective Connotation, Objective Connotation or Conventional Connotation.

Subjective Connotation refers to the sum-total of all the attributes suggested by the term to the mind of any individual. Whether these attributes actually belong to the objects denoted by it or not. The subjective connotation must vary from person to person, because to no two individuals the mention of a term brings up before the mind exactly the same ideas. It cannot, therefore, be of any importance in logic. For logic does not deal with the subjective and variable but with the objective and fixed. Subjective connotation may be regarded as the subject-matter of Psychology.

Objective Connotation is the sum-total of all the Known and Unknown attributes possessed in common by the objects referred to. The stand point in objective connotation is objective. But since a term is never actually used to refer to all the known and unknown qualities, objective connotation also is of little significance in Logic. It may be regarded as the proper subject-matter of Metaphysics.

Conventional Connotation or Artificial Connotation refers to those qualities and those alone which are regarded as essential to the objects. The essential attributes are not necessarily those which are common to the objects but those that are

most *fundamental* or rooted in their very *nature*, They constitute the definition of the objects, in the sense that the name in question would not be given to any object found wanting in any one of those attributes. Man would not be called 'man', if he were not an animal or if he were not rational. But he would still be a man if he did not laugh, or if he had six fingers in his hand instead of five. The essential attributes are most *directly* implied by the name. They are not *indirectly* implied because they are not *properties* derivable from more fundamental attributes which are directly implied. The essential attributes implied by a name are fixed. They are not fixed arbitrarily but by convention depending mostly on agreement in usage by competent authorities in the different departments of knowledge. The fixing of attributes removes ambiguity and vagueness from language, which is a necessary condition for accurate thinking. In logic, therefore, the term 'Connotation' is used in the sense of conventional connotation. Dr. Keynes has rightly suggested that other terms should be found out for Subjective Connotation and Objective Connotation. He proposes to use the term '*Intension*' for Subjective Connotation and '*Comprehension*' for Objective Connotation.

8. Does the Connotation ever Change ?

It is necessary from the point of view of logic that the terms should have a fixed meaning. Communication of thought is possible only when terms convey the same meaning to all. But since our knowledge is limited and changeable the connotation of terms is bound to change with the advancement in knowledge. Often the connotation changes on account of a gradual change in the usage of the term. For example 'Physician' originally implied 'a man who studies nature,' but gradually it came to mean 'a man who studies nature in respect of healing man'. Thus *connotation cannot be rigidly fixed*. The most that logic can demand is that connotation should, as far as possible, be fixed ; while

the least it must secure is that the *connotation of terms should remain unchanged throughout our reasoning processes.*

9. Relation between Denotation and Connotation : The Law of their Inverse Variation.

Denotation and Connotation are reciprocally opposed ; the greater the one the less the other. *If one increases the other decreases; and if one decreases the other increases.* This is known as the *Law of Inverse Variation of Denotation and Connotation.* Let us illustrate this by reference to the term 'man.' It denotes all men and connotes the attributes 'animality' and 'rationality,' which are common to all men. If we increase the connotation by adding the attribute 'honesty' (connotation of man + honesty = animality + rationality + honesty) the denotation will decrease for the men who do not possess the attribute 'honesty' will be excluded. If on the other hand, we decrease the connotation by excluding the attribute 'rationality' (Connotation of man—rationality=animality), the denotation will increase for the remaining attribute 'animality' will be possessed not only by all men but by all animals. Similarly it may be shown that an increase or decrease in denotation leads to a corresponding decrease or increase in the connotation. For example increase the denotation of 'man' by adding to it 'all other animals' (denotation of man and all other animals=all animals), the connotation will consist of the attribute 'animality' alone, for the attribute 'rationality' will not be possessed in common by the new class 'animals' and will therefore be excluded from its connotation. Again decrease the denotation of 'man' by excluding 'dishonest men' (denotation of 'man'-'dishonest men'='honest men') and the connotation will increase for the new class

will have one more important attribute in common, i.e., the attribute 'honest.'

The relation between denotation and connotation may be best shown by taking related series of terms as follows:—

1. Figure, Plane, Figure, Rectilinear plane figure, Quadrilateral, Parallelogram, Rectangle and Square.

2. Man, Animal, Living thing, Material thing, Thing.

Example 1 shows how gradual increase in connotation is followed by corresponding decrease in denotation, the first term of the series having the greatest connotation and the least denotation, while the last term having the least connotation and the widest denotation. Example 2 shows how gradual increase in denotation is followed by corresponding decrease in connotation, the first term of the series having the least denotation, and the greatest connotation, while the last term having the widest denotation and the least connotation.

10. Limitations to the Law of Inverse Variation.

The law of Inverse variation holds good only when the increase or decrease in denotation or connotation gives rise to the formation of a new term. It may not give rise to the formation of a new term under one of the following conditions:—

1. *When the additional attribute follows from the Connotation of the term or is possessed by all the members of the class.* For example, the term 'triangle' connotes 'the attribute of being a plane figure bounded by three straight lines.' If we add to it 'the attribute of having three angles,' the increase in connotation will not be real, for the attribute

follows from the connotation of the term and is possessed by all the members of the class to which it refers. The apparent increase in connotation does not make a new term. Hence the denotation is not changed.

2. *When the increase or decrease in denotation or connotation is subjective, that is, when the increase or decrease is not in the actual denotation or connotation but only in an individual's knowledge of it.* For example, the discovery of America by Columbus added to our knowledge of the denotation of the term 'continent,' but not to its actual denotation, which already included this continent. Hence there was no corresponding decrease in the connotation.

Further, it should be noted, that *the increase or decrease in denotation or connotation does not take place in a fixed numerical proportion.* We cannot say, for example, by how much the denotation of a term will decrease when its connotation is increased by the addition of one or more attributes. The decrease in denotation depends on the *nature*, not on the *number* of the additional attributes. Add to the connotation of 'man' the attribute 'civilized' and the denotation will decrease considerably; add to it the attribute 'blind' and the denotation will be reduced to almost a negligible fraction of the original denotation. Numerically the increase in connotation is the same in both cases, for only one attribute is added in each case, but in the latter case the decrease in denotation is much greater than in the former.

11. Opposition in Terms: Kinds of Opposition.

Sometimes there is opposition in terms in respect of their meaning. Terms implying attributes which exclude

each other or which cannot exist together in the same subject are called *Incompatible*. **Incompatible** terms are further divided into (a) **contradictory** and (b) **contrary**.

Contradictory Terms exclude each other and taken together exhaust the whole common sphere of their denotation. Because they exclude each other, they *cannot both be true*, and because they are totally exhaustive in denotation, they *cannot both be false*. For example, the terms *male* and *female* exclude each other, i.e., if a person is male, he cannot be female and vice versa. At the same time *male* and *female*, taken together, exhaust the whole common sphere of their denotation, i.e. the denotation of human beings. There are no human beings apart from those that are either *male* or *female*, that is, it is necessary that every human being must either be a *male* or a *female*. Such pairs of terms are called *contradictories* and the opposition between them is called *contradictory opposition*. Other examples of contradictory terms are *matter* and *spirit* ; *living* and *dead* ; *Indian* and *foreign*, etc.

The number of such contradictories, however, is limited. Therefore contradictories are usually formed by adding the prefix *not* or *non* to the original term, e.g. non-white, not-man, etc. Such terms are called **Infinite or Indefinite Terms*** because they apply to all the infinite number of objects apart from those signified by the corresponding simple terms, and taken along with the latter they exhaust the entire universe. Thus there is nothing in the universe that is not either *white* or *not-white*.

*Propositions in which such terms are predicates are called *infinite or limiting propositions*.

THE PRINCIPLES OF DEDUCTIVE LOGIC

According to Aristotle and some modern logicians infinite Terms are inconceivable. "If 'not-man' means that it ought logically to mean,—triangle, melancholy, sulphuric acid, as well as brute and angel,—it is an entirely impossible feat to hold together this chaotic mass of the most different things in any *one* idea, such as could be applied as predicate to a subject" (Lotze, Logic, Sec. 40). "In order to meet this objection the application of an infinite term is restricted by some logicians to a particular 'universe of discourse,' i.e., to the sphere of objects included under the proximate genus of which its corresponding simple term is a species. Thus not-while, according to this view, does not denote all things in the world except white things, but only all *coloured* things that are not white, its application being restricted to the universe of colour. But this modification seems to be quite unnecessary. For it is not impossible to hold together in mind by a single concept such a chaotic jumble of things as pointed out by Lotze. "Let the things be as varied and vague and chaotic to the imagination as you please, the negative bound of the absence of a certain attribute, 'whiteness,' is a *perfectly* intelligible bound, and denotes a group of things about which we can think and speak *intelligibly*' (Coffey, Science of Logic, p. 67).

It has been argued that such propositions as 'sound not-white,' 'Virtue is not blue' etc. are meaningless. To this Coffey replies "It would be more correct, perhaps to say that they are so obviously true as to be wholly superfluous—seeing that sound and virtue are not coloured things at all. They are not; and therefore it is *a fortiori* true that it is needless—to say they are neither white nor blue: 'As a matter of fact not even belong to some higher genus. But the fact of exclusion remains.' Contradictories which are formed by prefixing *not* or *non* to the term are called by Dr. 'formal or logical' contradictories, because the contradiction is apparent from their mere form without any reference to their meaning while the other contradictories are *material* because in their case it is not possible to ol

the contradiction without reference to their meaning.¹ (Dr. Venn, *Emperical Logic*, p. 191).

Contradictories are also formed by the addition of a negative prefix or suffix, e.g., *unpleasant*, *misfortune*, *unkind*, *insincere*, *senseless*. But whether such terms are to be regarded as true contradictories or not depends on whether or not they leave an intermediate state between them and their corresponding simple terms. Thus *unpleasant* is not the true contradictory of *pleasant*, because there is an intermediate state of indifference between the two; but *unequal* is the true contradictory of *equal*, because here there is no intermediate state possible. Two things must either be equal or unequal because in their case it is not possible to observe the contradiction without reference to their meaning.¹ (Dr. Venn, *Emperical Logic*, p. 191).

Contrary Terms are those which are most opposed under the same head, though not collectively exhaustive in denotation. Because they are opposed to each other they *cannot both be true* of a thing at the same time, but because they are not collectively exhaustive in denotation they *may both be false*. Thus *white* and *black* are contrary. They are most opposed to each other under the head of *colour*. But they do not collectively exhaust the whole universe of colour. A thing cannot be both black and white, but because other alternatives are possible, it may be neither black nor white. Similarly *wise* and *foolish*, *North* and *South*, *happy* and *miserable*, *virtuous* and *vicious* are contraries, because

¹Here it is important to note the distinction that while both members of a pair of *material* contradictories, e.g. "male" and "female," have *positive* connotation, one member of a pair of *formal* contradictories—the purely negative term has no positive connotation at all. And as to denotation while the sphere exhausted by a pair of material contradictories is always more or less limited that exhausted by a pair of formal contradictories is supposed to be co-extensive with all being." (Coffey, *Science of Logic*, p. 65.) The distinction between Positive and Negative Terms, about which we shall have more to say in the following chapter, is based on formal contradiction.

each of these pairs represents the opposite extremes in its own sphere.

Some logicians use the term **contrary** in a wider sense to indicate mere incompatibility and not the greatest degree of difference under the same head. According to this view even *red* and *yellow* are contraries of *white*, because a thing cannot be both *white* and *yellow* or *white* and *red* at the same time. Those who favour the narrower definition of contrary terms, explained above, use the term *Repugnant* to express the mere relation of incompatibility. According to them *white*, *red*, *yellow*, etc., are *repugnant* to one another¹.

12 Classification of Terms.

Terms may be classified under the following heads:—

- (1) Simple and Composite;
- (2) Singular and General;
- (3) Collective and Non-Collective;
- (4) Concrete and Abstract;
- (5) Positive, Negative and Privative;
- (6) Absolute and Relative, and
- (7) Connotative and Non-Connotative.

Some logicians have also added to this the distinction between **Univocal and Equivocal Terms**. Terms are said to be Univocal when they have only one definite meaning and Equivocal or Ambiguous when they have more than one meaning. But this is not the distinction of 'terms' used in the logical sense. For a term, in logic has only one meaning and when a word has more than one meaning it is equivalent to as many terms as there are meanings attached to it.

¹ Since it is difficult sometimes to draw a line between contrary and repugnant terms, the purpose of formal logic may be better served by giving up the distinction altogether and regarding all terms simply incompatible with one another as contraries.

It is obvious that the classification is based on different principles. The classes, therefore, are not mutually exclusive. The same term may belong to different classes from different standpoints.

13. Simple and Composite Terms.

We have seen that a term may consist of a single word or a number of words. **When a term consists of a single word, it is called a Simple Term: e.g., Book, College, Teacher, etc. But when it consists of more than one word, it is called a Composite Term: e.g. The United Nations Organisation, A beautiful flower, this plant etc.**

14. Singular and General Terms.

A Singular Term is one which can be applied in the same sense to only one definite object, e.g., India, The University of Allahabad, The highest peak in the world, The First President of the Indian National Congress, Aristotle.

A General (Common or Universal) Term is one which can be applied in the same sense to each one of an indefinite number of objects, e.g., man, table, square, President of the Indian National Congress, Centaur, Emperor of Switzerland. It is applicable to each member of a class because it signifies certain attributes, possessed in common by all the members. It is not necessary that the object signified by the general term should be actually existing. They may not exist at all as, for example, 'centaur' or 'The Emperor of Switzerland,' or only one such object may exist (or may have existed), e.g., the king of England and Spain, An English Sovereign six times married. All that

is necessary is that an indefinite number of objects to which the term *can* apply may be *conceived*. In the case of a singular term we cannot even *conceive* more than one object to which it can apply. Coffey says that "a good test for deciding whether a term is general or singular is to see whether it will take "*all*" or '*some*' before it; for, if it is a class name, statements may be made about *all* or *some* members of the class." Coffey's test will, however, not apply to terms with indefinite articles prefixed to them, e.g. 'a man,' 'an animal.' Such terms are general though they will not take 'some' or 'all' before them.

General names have their special use in simplifying thought and economising language. In the absence of a common name we shall have to give a proper name to each member of a class and to repeat the proper names of all the individual members whenever we want to say some thing about the class. Such a procedure would be awkward and infinitely tiresome.

Singular Terms are subdivided into *Significant* and *Non-significant*:

Proper names are non-significant singular terms, i.e., they are simply unmeaning marks arbitrarily given to one particular individual to distinguish him from others. As such they simply point out a particular object without implying any attributes.

Proper names are sometimes given to denote a class of object; as 'A Nepolean,' 'A Shakespeare,' 'A Bhim'. When thus employed they have some meaning but they lose their character as proper names. They do not merely identify certain individuals by *naming* them but *describe* them by mentioning some of their qualities.

There are, however, an infinite number of objects in the universe and they do not all have a proper name given

to them. How are we then to refer to a particular object not having a proper name? This we do by taking the common name of the class to which the object belongs and limiting its application to that particular object by prefixing a demonstrative or the definite article, or by adding a description, e.g., 'this book,' 'the chair,' 'the man who puts on a turban and has a long beard,' 'the three-storied red-coloured building on the Drummond Road with a weather-cock on it,' 'the present Governor General of India.' Such terms are singular and connotative. Hence they are called Significant Singular Terms. All general terms may thus be changed into Significant Singular Terms by prefixing some individualising word or phrase.

15. Collective and Non-Collective Terms: Collective and Distributive Uses of Terms.

A Collective Term is the name of a group of similar things; as army, library, navy, regiment. It is applicable to a group of things taken all together and not separately. The group must be composed of a number of *similar* things; if it is composed of dissimilar things it would not be regarded as collective. Thus "Calcutta" is not a collective term, because it is the name given to a collection of dissimilar object—roads, houses, gardens, market places, etc.¹

Dr. Venn points out that some proper names may be collective (Empirical Logic, p. 172). These are mostly the names of Geographical groups, for example, the Himalayas,

¹ It may be objected that every term is collective, because the object it denotes is composed of a number of similar elements. The point, however, is whether these latter are thought of as separable objects, bound together in one, when we think of the object referred to by the term.

the Alps, the Hebrides. They are proper names because they do not convey any information about the group of objects, which they denote, and they are collective, because they consist of a number of similar objects.

Terms which are not collective are simply called *Non-collective*. It is not proper to call them Distributive, because distributive terms exclude non-collective singular terms.

Some logicians regard collective terms as a separate class, falling under the same division with Singular and General Terms, thus implying an antithesis between (i) Singular and Collective Terms and between (ii) General and collective Terms. This is rather misleading. A collective term may be Singular or General, according as it is capable of applying to only one group or collection of things or to any one of an indefinite number of such groups. Thus "The 16th Rajput Regiment" and "The Imperial Library of Calcutta" are *Singular Collective Terms*, but "Army" and "Library." are *General Collective Terms*. The antithesis between General and Collective terms further breaks down in view of the fact that general terms may sometimes be used collectively and collective terms may sometimes be used distributively. A General Term, which, taken by itself, is not collective may be used in a collective sense by prefixing 'All,' in the sense of "All together," as "All the works of Shakespeare cannot be read in a day." "Similarly a term, which taken by itself is collective may sometimes be used distributively, as in the proposition "The class has signed the admission form." Here "class" means each student comprising the class individually.

It will thus appear that the real logical antithesis is between the *collective and the distributive use of names*.

A term is said to be used **Collectively** when the objects denoted by it are regarded as one whole and something is predicated of them that is true of them only as a whole or collectively. A term is said to be used **distributively** when the objects denoted by it are taken separately and something is predicated of them which is true of them individually.

The above distinction will be illustrated by the following propositions :—

- (1) All the *angles* of a triangle are equal to two right angles.

Here “All” means “All together ;” therefore ‘angles’ is used *collectively*.

- (2) All the *angles* of a triangle are less than two right angles.

Here “All” means ‘Each’ therefore, ‘angle’ is used *distributively*.

- (3) All *Englishmen* are white.

Here ‘Englishmen’ is used distributively ; for the proposition means ‘Each and every Englishman is white.’

- (4) The *Students of this college* consume sports material worth Rs. 5000 every year.

‘Students of this college’ is apparently used in the collective sense, though the prefix ‘All’ is here missing.

- (5) The *people* all fell on their knees.

‘People’ is used *distributively* since the proposition means ‘Each man fell on his knees.’

- (6) The *books* filled the shelf.

‘Books’ is used *collectively*.

In some cases it is difficult to decide from the proposition itself whether a term is used collectively or distributively. The difficulty is usually overcome when the proposition is considered with reference to the context.

Names of substances such as 'gold' 'air' 'oil' 'water' are frequently used in the distributive sense. When I say, for example, that 'Gold is heavier than silver,' I do not apparently mean that the total amount of gold in the world is heavier than the total amount of silver, but that bulk for bulk any piece of gold is heavier than silver. Sometimes, however, we may also think of a substance as a whole as Thales probably thought of 'water' when he said, "Water is the source of all things." In such cases a substantive name should be regarded as a Singular Collective Term. Very rarely, however, we think of a substance in this manner. Substantive names may, therefore, be generally regarded as General Terms.¹

16. Concrete and Abstract Terms.

A Concrete Term is the name of a thing. An Abstract Term is the name of an attribute or quality considered apart from anything. Thus 'man,' 'rose' 'triangle' and 'the University of Allahabad' are Concrete, because they are names of things; while, 'humanity,' 'redness,' 'triangularity' and 'fame' are Abstract, because they are names of qualities considered apart from things.

¹ It should, however, be observed that they are not like other general terms in as much as the pieces of any substance are perfectly homogenous in character. They are not strictly defined units and can be amalgamated or divided infinitely. Dr. Venn regards them in this sense as *peculiarly collective*. (Empirical Logic, pp. 170—1).

It is true that attributes do not exist apart from things. Redness, for example, can be found only in the objects that are red and not apart from them. But we may in our mind abstract the quality 'redness' from the objects that are red, that is, we may concentrate our attention on the quality alone, ignoring for the time being the things in which it resides. An Abstract Term, therefore, is so called¹ because it signifies an attribute considered in *abstraction* from the object or objects to which it naturally belongs.

An Adjective or participle is concrete not Abstract, because it signifies an attribute as *existing in something* and not apart from it. 'Wise,' 'coward,' 'long,' 'equal' are concrete, because they imply attributes as existing in things. 'Wise' really means 'a wise *person*,' 'long' means 'a long *object*' and so on. The corresponding terms 'wisdom,' 'cowardice,' 'length' and 'equality' imply the same attributes considered apart from the things; hence they are abstract. It should, however, be observed that an Adjective is abstract when it qualifies an abstract object instead of a concrete thing. For example, in the proposition "Leadership is a *rare* quality," the adjective 'rare' is abstract.

Some logicians think that adjectives are neither Concrete nor Abstract, because they imply neither things nor attributes apart from things. They include them under a separate class of terms called "Attributes." But this

¹ It is not so called because the idea expressed by it was arrived at by a process of abstraction. From this point of view all general terms will be abstract because we arrive at them in this manner.

be treated as Concrete, because it is the name of a thing which has some attribute assigned to it. On a little reflection, however, it will appear that this view is logically unsound. Names of attributes considered apart from things should be treated as abstract whether they are regarded as subjects of further attributes or not.

Dr. Keyne's view is based on the definition of *thing* as "Whatever is regarded as possessing attributes." According to this definition a *concrete* name must be "the name of anything, which is regarded as possessing attributes, i.e., as a *subject of attributes*;" while an *abstract* name must be "the name of anything which is regarded as an attribute of something else, i.e. as an *attribute of subjects*." The distinction between concrete and abstract names thus resolves itself into the distinction between concrete and abstract *use* of names, and coincides with the use of terms as subjects and predicates, which renders it logically more or less superfluous:¹

Our own principle of distinction between abstract and concrete terms is not easily applicable in all cases, but it is to be preferred because "it is at least simple and intelligible, and it is based on the sound Aristotelian division of all objects of thought into *substances* and *accidents*."²

We may thus finally conclude that.—

(1) A concrete Term is the name of a thing (person, place, event or any other individual existent) or an attribute presented as actually qualifying a thing (i.e. an adjective qualifying a concrete term).

¹ Cf. Coffey, *Science of Logic*, p. 60.

² *Ibid* p. 60.

are minute variations in the degree of their blood redness. It seems illogical, therefore, to base distinctions of general and singular in Abstract terms on variations in degree.

17. Positive, Negative, and Privative Terms.

A Positive Term expresses the presence of a quality, or object e.g. man, good, equal, white, happy, etc. **A Negative Term** expresses the absence of a quality or object and nothing else, e.g., not-man, not-good, not-equal, not-white, non-happy, etc. These terms imply the *absence* of a quality or object and they *do not imply anything else*. If a term implies the absence of some quality and at the same time the *presence* of another it is not a purely negative term. **A Privative term** expresses the absence in an object quality which it is capable of possessing or which the other members of the same group normally possess, e.g. blind, deaf, barren, empty, ignorant, etc. The term 'deaf' implies that the person to whom reference is made is devoid of the power of hearing which he is capable of developing or, at least, which men ordinarily have. Similarly a woman is called 'barren,' because she is found lacking in the quality of begetting a child which women generally possess. We cannot call a foot-ball barren, because it is not at all capable of giving birth to a child.

It may here be stated that purely negative terms are identical with formal contradictory terms. A negative term implies the absolute negation of the object implied by the corresponding simple term and is therefore formed in the same manner in which most of the formal contradictory terms are formed i.e. by the prefixing *not* or *non* to the positive terms. Terms ending with the suffix *less* or

beginning with the prefixes *im*, *mis*, *in*, *ant*, though negative in form are not in most cases to be treated as such because they are positive in meaning. Thus *unhappy* does not merely indicate the absence of happiness but the presence of misery and is really equivalent to *miserable*; *unkind* does not mean simply the absence of kindness in a person but the presence of *cruelty*; *immoral* does not mean simply *not-moral* but positively *vicious*; *invaluable* does not imply non-valuable but *most valuable*.¹

Wetson holds that most such terms are *privative*. For he says "we should not apply 'unkind' except to a morally responsible being and one, who is, therefore, capable of being kind, nor 'unhappy' to a being, incapable of enjoying happiness. It should be noticed that the connotation of a Privative Term is partly negative, in that the word implies the absence of a certain attribute, and partly positive, because it implies the presence of some attributes which are compatible with that denied as well as very often of some others which are incompatible with it. Thus 'unhappy' implies absence of happiness, capacity for feeling happiness, and presence of some degree of misery" (Manual of Logic, Vol. I. p. 71).

Some terms positive in form are negative in meaning, e.g. *alien* (not-belonging to a particular country), *idle* (not-active), doubtful (not-having belief). Thus whether a term is really positive or negative or privative can only be determined by an examination of its meaning and not by its form.

¹ Coffey explains the reason why such terms are not to be regarded as Negative thus: "When we deny an attribute of a subject, the reason of the denial is often to be found in the subject itself—in the fact that there are in that subject other attributes incompatible with the one denied of it. For these latter we have no special name, contenting ourselves with a negative term based upon the denial of the positive attribute." (Science of Logic., p. 6.).

18. Absolute and Relative Terms.

An Absolute Term is that which does not in its very meaning imply necessary reference to anything else. For example man, sun, dog, chair, etc., are absolute terms because we can understand their meaning without reference to any other object.

A Relative Term is that which in its very meaning implise necessary reference to some thing else. It is related to another term in such a way that in trying to understand the meaning of one we have necessarily to think of the other. Relative terms therefore, go in pairs, e.g. father-son, husband-wife, North-South, up-down, more-less, rich-poor, first-second. Each one of such a pair of terms is called the *correlative* of the other. Sometimes the correlatives have a common name, e.g., friend, partner, equal, like, near.

In a sense there is nothing in the world which is not related to something, or rather which is not in a way related to everything else. But the mere *existence* of such relation is not sufficient to make a term relative. The relation must be clearly suggested by its very *meaning*. Thus the relation of ruler and ruled exists between king and man, but 'king' and 'man' are not correlatives, because the relation is not *implied* by them. 'King' and 'subject' however are correlatives because the relation is implied in their meaning. In fact each one of a pair of correlatives *derives* its name from the same fact or facts which form the basis of relation and are, therefore called the *fundamentum relations*. "Thus each members of a pair of correlatives connotes the same fact viewed from a different standpoint; paternity and sonship are not two different facts but the same fact viewed from two different sides, and con-

noted both by parent and by son. So rule and subjection imply the same condition of things regarded from the point of view of the ruler and of the subject respectively." (Welton, *Manual of Logic*, I, p. 77).

It should be observed that only concrete terms can be Relative. Thus "*equality* and *likeness* are not relative terms though *equal* and *like* are; for it requires two things to be either equal or like, but the fact of equality (or likeness) is one," (ibid).

19. Connotative and Non-Connotative Terms.

The names "connotative" and "non-connotative" are misleading in character. "Connotative" ordinarily means that which has connotation and "non-connotative" means that which has no connotation. This is not, however, the sense in which the names are used by modern logicians who usually follow Mill in defining a **Connotative Term** as one which **has both denotation and connection** and a **non-connotative term** as one which **has either denotation or connotation but not both**.¹

Most terms in the sense just explained, are connotative i.e., they have both connotation and denotation. For example, 'man,' denotes 'all men' and connotes the attributes 'animality' and 'rationality'; 'yellow' denotes all 'yellow things' and connotes the attribute 'yellowness.' There are only two classes of terms which are non-connotative: (i) *Proper Names* and (ii) *Singular abstract Names*. Proper

¹ It should be noted that the above definitions are slightly a modification of the original definitions given by Mill, which on account of their ambiguous character have given rise to much discussion as to whether certain class of names are or are not connotative. (See Keyne's *Formal Logic* pp. 40-1.)

names are non-connotative, because they have denotation but not connotation. For example, Chandrama Singh, Schultze and Tojo denote certain individuals but they do not have any recognized meaning or connotation. Singular abstract terms are non-connotative, because they have connotation but not denotation. For example, 'milk-whiteness' and 'triangularity' simply connote an attribute, without denoting any object. The question, however, whether Proper Names are connotative or not has been very much disputed among logicians and deserves full consideration.

20. Are Proper Names Connotative ?

According to Mill and some other logicians Proper Names do not have connotation. The object to which Proper Names are attached themselves have attributes, but Proper Names are not given to them *because of* the attributes. They are simply unmeaning marks arbitrarily given to certain individuals to distinguish them from the rest. "When we name a child by the name of Paul or a dog by the name of Caesar," says Mill, "these names are simply marks used to enable these individuals to be made subjects of discourse." This is why a proposition does not by itself, (i.e., in detachment from a proposition) give us any information about the qualities of an object unless we are *already acquainted* with it; and when we are acquainted with it a *change in the name does not make any difference to us*. If a man whom we know changes his name from John to Tom we are not perturbed by the change, for the new name, tells us nothing different from the old. This is not however the case with the names, which have connotation. If, for example, we change the name of a thing from, 'vegetable,' to

animal,' the new name makes a great change in our knowledge of the thing.

It may be objected that there must be some reason for giving a particular name to an object. This may indeed be true in some cases. Sree Chaitanya was named 'Nimai,' because he was born under a Neem tree; the province of Punjab was named after the five important rivers flowing through it. Similarly a child may be named Sherdil Singh, because he appears to possess the quality of fearlessness such as possessed by lions, or a town may be named Dartmouth, because it is situated at the mouth of the river Dart. But several considerations prevent us from regarding Proper Names as connotative on this ground:

(a) Proper Names are not always originally given to signify certain attributes. For example, a child is often named 'Gopal' not because he possesses the qualities of a 'cowherd boy' or of the Hindu god known by that name, but simply because his parents choose to call him by that name on account of their own religious predilections.

(b) Proper Names may be given to children to signify accidental qualities or essential qualities. They cannot be given to signify essential qualities, because these are mostly developed and known afterwards. And, if they are given to signify accidental qualities, as, for example in the case of the Proper Name 'Ganga Ram,' which might be intended to imply that the person so named was born on the bank of the river Ganges, they cannot be said to be connotative, because accidental qualities do not form a part of the connotation of a term.

(c) Further, even if it be admitted that a Proper Name is some times given to signify some quality, it is important

to recognise that a *name once given is independent of the attribute or attributes on account of which it may have been originally given*. Thus a town may have been named Dartmouth, because it is situated at the mouth of the river Dart. But "it is no part of the significance of the word Dartmouth to be situated at the mouth of the Dart. If sand should choke up the mouth of the river or an earthquake change its course, and remove it to a distance from the town, the name of the town would not necessarily be changed. That fact, therefore can form no part of the significance of the word; for otherwise, when the fact confessedly ceased to be true, no one would any longer think of applying the name" (Mill). Similarly Sherdil Singh may be so named, because he promises to be brave and dauntless but if he turns out to be a coward, no one should call him by that name, which may even be substituted by some such name as 'Gidardil Singh' (a jackal at heart) to indicate his cowardice. But this does not usually happen. It is evident, therefore, that if a Proper Name is given to an object on account of a certain attribute, it subsequently becomes independent of it.

It may be held that Proper Names are connotative at least in the sense that they indicate the sex, nationality or caste of the individuals denoted by them. For example, the name 'John Smith' indicates that the person referred to is a Teuton and a male, the name 'Padmavati' implies that the person is a Hindu and a female, and the name Mohammad Ali implies that the person is a Mohamman and a male. But a Proper Name does not at times suggest even this much. For example, the name Epicurus or Cyrenaic will not even tell most people whether it refers to a man or to an animal or to a plant. Besides there is

nothing to prevent us from giving names usually given to people of one nationality or caste to people of a different nationality or caste. Names of men are often given to dogs and other animals. In Hindu families, for instance, the name 'Ganga Ram' is given to men as well as to parrots. Similarly there is nothing to prevent one from giving the name 'Bahadur Singh' to his walking stick or the name Chamberlain' to his umbrella.

Some writers while agreeing on the whole that Proper Names do not have connotation of their own, still maintain that they have an *acquired connotation*.* Thus, says Bosanquet, "A Proper Name has a connotation, but not a fixed general connotation. It is attached to a unique individual, and connotes whatever may be involved in his identity, or is instrumental in bringing it before the mind." (*Essentials of Logic*, p. 93). The name Mohan Das Karam Chand Gandhi, it would be admitted, was originally unmeaning, but on account of its association with the person to whom it is now attached, it has come to acquire a certain meaning, which, on its mere utterance flashes on the mind of the person, who knows him. It suggests at once his devotion to Truth and Non-violence, and a number of other qualities that are associated with him. These, therefore, constitute its connotation.

It is obvious that the word 'connotation' has here been used in a different sense. It has been used to signify *the qualities suggested* by a name. But suggestion and connota-

*They assume at the same time that all names in the very beginning of the development of language had acquired connotation. (cf. Bosanquet, *Logic*, Vol. I.).

tion are two different things. Qualities that are suggested by a name do not form a part of its meaning. The knowledge of these is not conveyed by the name as such. For our knowledge of these we depend on some source other than the name. But the qualities that are connoted form a part of the very meaning of the name. The name by itself is sufficient to call them up to our mind. For instance, the name 'water,' by itself conveys to our mind the qualities of fluidity and of quenching thirst or extinguishing fire. But the name 'Mohan Das Karam Chand Gandhi' does not by itself convey to us the qualities usually associated with it. To the persons who have neither met Mahatma Gandhi, nor read or heard about him the name does not convey any information whatsoever.

Besides *connotation* of a term, in its true sense, is fixed. But connotation, which is acquired necessarily varies from time to time and from person to person. The name Mohan Das Karam Chand Gandhi suggested different qualities at the different stages of the career, of Mahatma Gandhi and it also suggests different sets of qualities to different persons according to their knowledge of him. There are, in fact, in the latter sense as many different connotations of the name as there are persons who know him.

Proper Names are, however, connotative when they are used to denote a type of character, e.g. A Shakespeare, A Napoleon, A Yudhisthir. But when Proper Names are so used they cease to be Proper Names in the strict sense of the term and become general names. Proper Names like *President Roosevelt*, *Prof. Radhakrishnan* and *General Smuts* are partially connotative, because they consist of parts, which have a fixed meaning.

(d) *The University of Allahabad*. Composite, Singular, Non-collective, Concrete, Positive, Absolute, Connotative.

(e) *University*. Simple, General, Non-collective, Concrete, Positive, Absolute, Connotative.

(f) *Man*. Simple, General, Non-collective, Concrete, Positive, Absolute, Connotative.

(g) *Humanity*. Simple, Singular, Non-collective, Abstract, Positive, Absolute and Non-connotative.

(h) *White*. Simple, General, Non-collective, Concrete, Positive, Absolute, and connotative.

(i) *Whiteness*. Simple, Singular, Non-collective, Abstract, Positive, Absolute, Non-connotative.

(j) *Water*. Simple, Singular or General (e.g. in the proposition "Water is our life" it is singular, but in the proposition "Water is heavier than oil" it is general), Collective (as in the proposition "Water is the source of all things") or Non-collective (as in the proposition "Water of this spring is rich in minerals."), Concrete, Positive, Absolute, Connotative.

(k) *Relation*. It has two meanings :

(1) The persons related to, and.

(2) The relation existing between persons or objects.

In the first case it is Simple, General, Non-Collective, Concrete, Positive, Relative, and Connotative.

In the second sense it is Simple, General, Non-Collective Abstract, Positive, Absolute.

(i) *Idle*. Simple, General, Concrete, Non-Collective, Concrete, Negative (if taken to imply absence of work) or Privative (if taken to imply capability to work), Absolute, and Connotative.

EXERCISE V

1. What is a "term" in Logic? Distinguish it from a "name" and a "word." (U.P.B. 1926).

2. Give the logical meaning of Concept and Term.

(C. U. 1910.)

3. Explain and illustrate the difference between the following divisions of terms:—

(a) Contrary—contradictory.

(b) Negative—Privative.

(c) Connotative—Non-connotative. (P. U. 1930).

4. Explain and illustrate the chief distinctions of terms.

5. Distinguish between:—

(i) Absolute and Relative Terms.

(ii) Negative and Privative Terms.

(iii) Collective and Distributive use of Terms.

6. Explain the difference between the distributive and collective use of a term. State whether the subject of each of the following is used distributively or collectively:—

(a) The students surrounded the college hall.

(b) The students filled up class enrolment forms.

(c) Two wrongs do not make a right.

(d) The nationalists have a prejudice against the co-operators.

(e) The angles of a triangle are less than two right angles.

(U. P. B. 1933).

7. What is meant by the Denotation and the Connotation of terms? How are they related to each other? (U. P. B. 1931).

8. Criticise the following statement:— "Connotation and Denotation vary in inverse ratio". (C.U. 1927).

9. It has been said that every name has two kinds of meaning. What does this mean? Are there any exceptions to this rule? (D. U. 1937).

10. Has every term a connotation? Fully discuss this question, noticing different views. (U. P. B. 1928).

11. Are Proper Names non-connotative? Fully discuss this question, noticing different views and giving your own with reasons to support it.

12. Describe the logical character of the following terms:—

The Highest Mountain in the World; Alexander the Great; Virtue; Virtuous; Long; Length; Idleness; A dense forest; Guardian; Squariness.

CHAPTER VI

THE-PREDICABLES

1. Definition of Predicables.

The Predicables are a classification of the relations which the predicate of a logical proposition may bear to its subject. The number of predicates is practically infinite. But from the point of view of the possible relations in which they may stand to the subject of a proposition, they are arranged under a few definite heads, each of which is called a *Predicable*.

A Predicate is that which is actually said of a subject ; a Predicable is anything which *can* be said of it. It does not express what a term is *by itself*, but what particular *relation* it bears to the subject of the proposition of which it is the predicate. The same predicate may stand in different kinds of relation to different subjects. Hence the same predicate may be assigned to different heads of predicables according to the relation in which it stands to the subject of a proposition of which it forms the predicate.

2. Porphyry's Heads of Predicables.

Modern logicians follow Porphyry in recognizing the following 'Five Heads of Predicables,' also known as 'The Five Words of Porphyry':—

Genus,
Species, .
Differentia,
Proprium,
Accident.

This is not a logical division, for the first two, as it will soon be observed, refer to classes, and the next three refer to attributes. In any case, it is claimed that in every logical proposition the predicate, in relation to the subject must be one or other of these five.

Genus and Species.

Genus is a wider class in relation to the Smaller classes contained under it. Species is a smaller class in relation to the wider class under which it is contained. For example, 'animal' is 'genus' in relation to 'man,' while 'man' is species in relation to 'animal'; 'Triangle' is genus in relation to 'isosceles triangle,' while 'isosceles triangle' is species in relation to 'triangle.' *Genus and Species are relative terms.* The same term may be genus in relation to one term and species in relation to another. For example, 'Animal' is a genus in relation to 'man,' but it is a species in relation to 'Living Beings.'

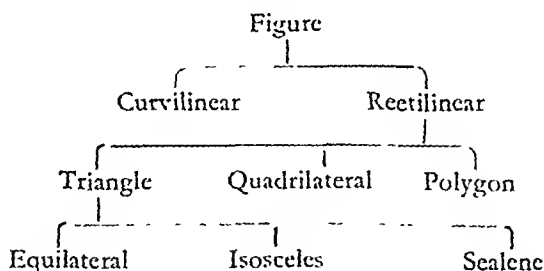
The relation between Genus and Species is often expressed by saying that the *Genus includes the Species and the Species includes the Genus.* From the point of view of denotation the Genus includes the Species but from the point of view of connotation the Species includes the genus. This is but natural in view of the law of inverse variation of denotation and connotation.

If a term is so general that it is not a species of any more general term it is called a *Summum Genus* or Highest Genus; if a term is so narrow in extent that it cannot be further divided into species, but only into individuals, it is called an *Infima Species* or Lowest Species. Thus a Summum

genus cannot be a species while an *Infima Species* cannot be a genus.

It may be noted that "when a General Term is predicated of another General Term, it is Genus and the subject a species; but when a General Term is predicated of a Singular Term, it is a species, for it is under *Infima Species*, that individuals are directly included."*

The intermediate classes between the Summum Genus and the Infima Species in a series of general terms are called *Subaltern genera or Species*. Two or more classes which rank as species under the same Genus are called *Cognate Species or Co-ordinate Species*, whereas each one of the higher classes under which the same species falls is called *Cognate Genus*. The nearest Genus to a term is called its *Proximate Genus*. In the following example :—



Equilateral, Isosceles and Scalene triangles are Cognate species of the subaltern genus Triangle; Triangle, Quadrilateral and Polygon, are cognate species of the subaltern genus Rectilinear Figure; and triangle is the proximate genus of Equilateral, Isosceles or Scalene triangle, while Triangle, Rectilinear Figure and Figure, are their cognate genera.

* Welton : A Manual of Logic. Vol. I, p. 82.

Differentia.

Differentia (or **Difference**) is the attribute or attributes by which one species is distinguished from all others contained under the same genus. For example, in the proposition 'Man is rational,' 'rational' is the differentia of 'man' because by the quality of rationality man is distinguished from all other animals. Differentia is a part of the connotation of a term. We have noted that a species is wider in connotation than the genus, under which; from the point of view of denotation it is contained. *The excess of the connotation of a species over that of its proximate genus is its differentia.* To get the differentia of a species, therefore, we have only to subtract from its connotation the connotation of its genus. Similarly we get the connotation of a species by adding its differentia to the connotation of its proximate genus, and we get the connotation of a genus by subtracting the differentia of its species from the connotation of the species. Thus from the point of view of connotation.

The Species—The genus=The differentia.

The genus÷the differentia=The species.

The species—the differentia=The genus.

Proprium or Property.

A Proprium or Property is an attribute which is not a part of the connotation of a term, but which easily follows from it. For example; all triangles are three-angled. The quality of having three angles is the proprium of 'triangle,' because it is not a part of its connotation but it necessarily follows from its connotation. There are two ways in which a proprium may follow from the connotation, viz., either

as a conclusion from premises, or as an effect from a cause. That the square on the hypotenuse of a right-angled triangle is equal to the sum of the squares on the two sides, is a proprium which follows from the connotation of triangle as conclusion from premises. The 'power of judging' which man possesses is a proprium, which follows from the connotation as an effect from a cause, 'rationality' being the cause and 'power of judging,' the effect.

A Proprium is either *generic* or *specific*. A Generic Proprium is one which follows from the connotation of Genus; a Specific Proprium is one which follows from the connotation of the species or the differentia. Thus in the proposition 'An isosceles triangle has its three angles equal to two right angles,' the proprium, viz., 'the attribute of having three angles as equal to two right angles,' is a generic proprium, because it follows from the connotation of the genus viz., the connotation of 'triangle' and not from that of 'isosceles triangle'; while in the proposition 'An isosceles triangle has two equal angles,' the proprium, viz., 'the attribute of having two equal angles' is a specific proprium, because it follows, from the connotation of the species or the differentia of 'isosceles triangle.'

Accidents or Accident.

Accident is generally defined negatively as **an attribute which is neither a part of the connotation of a term nor such as can be deduced from it.** In this class are included all those attributes which are included under neither of the heads Genus, Differentia or Proprium. Accident is opposed to *Essence*, which means 'the very being of a thing, whereby it is what it is. The essence of a thing is identical

with its connotation. Thus whatever does not belong to the connotation of a thing is its Accident. An Accident may be removed from a thing without necessitating a fundamental change in its character, but *Proprium* or *Differentia* cannot be removed without changing its character or destroying it altogether.

Accidents are either of a class or of an individual and in both cases they may be either *Separable* or *Inseparable*. Thus there are four kinds of Accidents :

1. Inseparable Accident of a class.
2. Inseparable Accident of an individual.
3. Separable Accident of a class.
4. Separable Accident of an individual.

An Inseparable Accident of a class is an attribute which is always present in all the members of the class, e.g., blackness in crows, yellowness in gold or whiteness in silver. So far as our experience goes blackness is found in all crows, yellowness in all pieces of gold and whiteness in all pieces of silver, and yet these qualities are not part of the essential nature of these objects.

An Inseparable Accident of an individual is an attribute which is always present in the individual and can never be changed, e.g., the date and place of a man's birth.

A Separable Accident of a class is an attribute which belongs to some members of the class and not to all, e.g., blackness in crows or sweetness in mangoes.

A Separable Accident of an individual is an attribute which is sometimes present in the individual and sometimes absent, e.g., a man's dress, profession, engagements, habits, thoughts, etc.

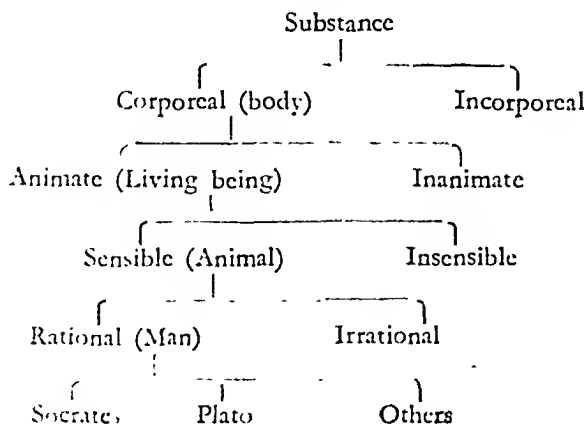
It is necessary to distinguish clearly between an inseparable accident and a *proprium*. Both *proprium* and inseparable

accident are attributes which belong to all the members of a class, but the former is necessarily connected with its essential nature while the latter is not. No doubt, when an attribute is found to be invariably possessed by all the members of a class, the natural suggestion is that it is in some way or other causally connected with its essential nature. But so long as the causal connection is not discovered we prefer to call it an inseparable accident rather than a proprium. It must, however, be admitted that the distinction between proprium and inseparable accident, is difficult to apply in practice, and is not, therefore, of much logical importance.

3. Porphyry's Tree.

The main heads of predicables, viz., Genus, Species and Differentia are exemplified by what is known as Porphyry's Tree.

It is named after Porphyry because it was first set forth by him. The tree is as follows :—



Here 'Substance' is the Summum Genus, 'Man' is the Infima Species, the intermediate classes between 'Man' and 'Substance' e.g., 'Body,' 'Living Being,' 'Animal' are Subalterm Genera and Species, while the attributes 'Corporeal' 'Animate' etc., are Differentia, dividing each genus into species.

4. Defects of Porphyry's Scheme of Predicables.

Porphyry's scheme of predicables has been recognised by logicians for centuries, and it is the most useful scheme for purposes of division and classification. The scheme, however, does not seem to be altogether free from difficulties. *Firstly*, the distinction between property and accident is not justified in the case of an individual. There is no quality in an individual which does not follow from his *nature as that individual*. The habit of smoking cigar in the case of Mr. Churchill (or the habit of wearing a loin-cloth in the case of Mahatma Gandhi) is a necessary concomitant of his whole individual personality, though it is not causally connected with his nature as man. *Secondly*, if the subject of a proposition be an individual, it is difficult to decide sometimes, whether the predicate is a species or a genus. For example : Mahatma Gandhi is a Gujrati, an Indian or an Asiatic. Shall we say that each of these predicates is a species? If not, on what basis shall we distinguish genus from species? *Thirdly*, there is no room in the scheme for a proposition in which the predicate is a singular term; e.g., This man is John. *Fourthly*, it does not take any notice of those forms of predication in which class and attribute are combined, e.g., Man is a rational animal.

It is necessary to point out however, that Porphyry himself had never intended to give an exhaustive list of

the different classes of relations in which the predicate may possibly stand to the subject. It is the later logicians who applied his Five Words to this purpose.

5. Aristotle's Heads to Predicables.

Aristotle had classified predicables into four heads, namely, Genus, Definition; Porprium and Accident. Porphyry dropped Definition and added Differentia and Species, thus making his scheme five-fold. The reason for this change was that Aristotle's point of view in laying down his scheme was the *definition* of a subject, while Porphyry's point of view was the division of a class. Aristotle did not mention species because he regarded it as the thing to be defined, the subject. Besides, he must have thought, that when a species is predicated of an individual it cannot be distinguished from genus, and when it is predicated of a class, it is an accident, e.g., 'Some animals are men.' He did not mention differentia, because it was absorbed into genus. When we say 'Man is rational,' we actually refer him to a genus, i.e., to a wider class which also includes living beings other than those having the quality 'rational.'

Apparently, Aristotles list of predicables is more exhaustive.

6. Uses of Predicables.

(1) Predicables and Propostions.

The predicables help to make the meaning of a proposition clear by bringing out the exact relationship between the subject and the predicate. The classification of propositions into Analytic and Synthetic, from the point of view of their meaning is, thus, naturally based on predicables. (See Chap. IX).

(2) Predicables and Definition.

The Predicables are useful in defining terms and detecting fallacies. We usually define a term by mentioning its genus, and differentia. If the definition includes only the genus and not the differentia it is too wide, if it includes an accident it is accidental; if it includes a separable accident it is too narrow; and if it includes a proprium it is redundant. (See Chap. VIII)

(3) Predicables and Divison.

Division aims at a complete analysis of the denotation of a term. This is possible only with the help of predicables. For when we divide a class into its sub-classes, we actually split a genus into its constituent species on the basis of a quality which is possessed by some members of the class only, i.e., a separable accident. (See Chap. VIII)

7. Examples Worked out.

State which of the predicables are illustrated in the italicised words of the following sentences :—

- (a) A fountain-pen is usually *black*.
- (b) An equilateral triangle is *equiangular*.
- (c) All colleges *impart higher education*.
- (d) This man is an *Indian*.
- (e) Logic is a *good mental discipline*.
- (f) All Negroes are *wooly haired*.

Answer :—(a) *Black* is an accident, because it is neither a part of the connotation of 'fountain-pen,' nor does it follow from the connotation. It is a *separable accident* because it does not refer to a quality possessed by all members of the class.

(b) '*Equiangular*' is a *proprium* because the quality (equiangularity) to which it refers follows from the equilateral nature of the given triangle.

(c) *Impart higher education*: This is a *differentia*, because it has been used to distinguish college from other kinds of educational institution.

(d) *Indian* is really species of the genus 'man'; but in this case the subject stands for a particular individual of which the species has been predicated.

(e) *Good mental discipline* is here used as a *proprium*, because it follows from the connotation of 'Logic.' The fact that Logic is a science itself makes it a good mental discipline, but this quality is further strengthened by the *differentia* of logic which is the attribute of 'its dealing with the principles of correct thinking.'

(f) *Wooly Haired* is here an accident, because the quality to which it refers neither forms a part of the connotation of the subject nor follows from it. It is an *inseparable accident*, because so far as our experience goes it is found in all members of the class.

EXERCISE VI

1. Enumerate and define Predicables. How are they connected with Division and Definition? (U. P. B. 1925).

2. Distinguish between *Differentia*, *Property* and *Accident*. Give examples of each. (U. P. B. 1928).

3. Compare Aristotle's and Porphyry's classification of Predicables, explaining the different points of view from which they arrived at their classifications. (U. P. B. 1935)

4. Define and illustrate the five predicables. In what sense may we say that genus is part of the species, and in what sense that the species is part of the genus? (C. U. 1930)

5. Explain and illustrate the Predicables. Have they anything to do with the distinction between Real and Verbal Propositions? (C. U. 1919)

6. What do you understand by each of the Predicables? Taking 'College' as the subject make five propositions so as to illustrate every variety of predicate in relation to the subject (P. U. 1930.)

7. Explain clearly what is meant by Predicables. To which of the predicables does each of the italicised words belong?

(1) Logic is a *formal science*.

(2) Fire *burns*.

(3) Plato was an *Idealist*.

(4) Buddha was a *Prince*.

8. Distinguish between (i) Differentia and Property and (ii) Property and Inseparable Accident, giving example in each case.

Refer the following predicates of Gold to their proper Heads in Predicables.

(1) Gold is a metal.

(2) Gold is found in India.

(3) Gold is yellow.

(4) Gold is called *Sona* in Hindustani.

(U. P. B. 1933)

9. Which of the Predicables does each of the following predicates represent and why?

(1) All the angles of a square are equal.

(2) Iron is a cheap metal. (The predicate consists of two parts: 1. *Cheap* and 2. *Metal*.)

(3) Sugar is sweet.

(4) London is the largest city in England.

(5) Even men are animals.

(6) Most Englishmen are brave.

(7) All republics are government.

(8) Englishmen are keen sportsmen.

(9) All men can study logic.

(10) All quadrupeds which have horns chew the cud.

(11) All ducks are web-footed.

(12) Men smoke.

CHAPTER VII

DEFINITION

1. Aim of Definition.

Logic, as we have already indicated, demands that the meanings of the terms we employ in reasoning should be clear and definite. We do not usually pay sufficient attention to this. The result is that language instead of contributing to knowledge often leads to confusion, obscurity and error.

Logic recommends Definition as a means for fixing the meaning of terms and seeks to lay down rules for the same. Every term as we have seen, has two kinds of meaning—meaning in extension and meaning in intension. There are, therefore, two ways of explaining or defining the meaning of terms. The process of explaining terms with reference to the objects to which they apply is known as *Extensive Definition* or *Division*; while the process of explaining terms with reference to the attributes which they connote is known as *Intensive Definition* or *Definition in the ordinary sense*. The former process will be dealt with in a subsequent chapter. The present chapter will deal with Definition in the ordinary sense.

2. Nature of Definition Per Genus Et Differentiam.

Definition is the precise statement of the full connotation of a term—But this does not mean that in order to define a term we have to draw up a list of all the essential attributes it implies. Apparently this would be a very trouble-

some process. It is considered sufficient to define a term *per genus et differentiam*. We first point out the *proximate genus* or the class to which a term belongs and then state the *differentia* or the attributes, which mark it out from the other species of the same class. Thus 'man' may be defined as 'a rational animal.' Here 'animal' is the genus and 'rational' is the *differentia* of 'man.' The genus and the *differentia* together exhaust the entire connotation. Care must, however, be taken that the genus mentioned be the proximate genus; otherwise the definition would leave out a part of the connotation, and will apply to other things besides the thing defined. For example, the definition of 'square' as 'a parallelogram having its adjacent sides equal' would leave out the attribute—'right angled,' and would be applicable to figures other than squares, i.e., lozenges.

3. Rules of Definition.

The following rules of definition have generally been recognized by logicians, as conditions which a good definition must fulfil or as warnings against the errors commonly committed in defining terms :—

1. A Definition should state neither more nor less than the full connotation of the term defined.

If the definition states *more* than the connotation, one of the following fallacies may arise :—

(a) If the additional attribute be a *property*, i.e., an attribute which is not a part of the connotation of the term, but which follows from its connotation, the fallacy of **Redundant, Over Complete or Superfluous Definition** would arise. For example, the definition 'A triangle is a plane figure'

bounded by three straight lines, *of which the three angles are together equal to two right angles*' is redundant, because the attribute 'having three angles which are together equal to two right angles' is a property. Similarly the definition of 'man' as a 'rational animal *capable of drawing inferences*' is redundant, because the capacity of drawing inferences is a property.

(b) If the additional attribute be an *accident*, that is, if it is neither a part of the connotation nor follows from the connotation, but is found to belong to the objects denoted by the term, the fallacy of **Accidental Definition** would arise. For example, 'man is a *laughing* animal,' 'Gold is a *precious* metal,' 'A gentleman is a man *who wears English clothes*,' 'A bachelor is a man *who looks before he leaps and having looked never leaps at all*. (McCardie, J.)

If the definition states *less* than the connotation we have the fallacy of **Incomplete** or **partial definition**. For example the definition 'Man is an animal' is incomplete because it leaves out the essential attribute 'rational'; the definition—'Man is rational' is incomplete because it leaves out the attribute 'animal.'

2. A Definition should be convertible with the term defined i.e., it should exactly coincide in extent with the denotation of the term. For example, we may say 'All men are rational' or we may convert this proposition and say 'All rational animals are men?' When a definition is not convertible it gives rise to the fallacy of either **too wide** or **too narrow definition**. It is too wide if it includes objects not contained in the denotation of the term; it is too narrow if it excludes objects that are included in the denotation of the term. For example, the definition 'A triangle is a plane

figure' is too wide because it includes squares, rectangles and quadrilaterals, etc. ; the definition 'A triangle is a plane figure bounded by three *equal* straight lines' is too narrow because it excludes isosceles and scalene triangles.

3. The definition should not contain the term defined or any of its synonyms. The violation of this rule gives rise to the fallacy of **Synonymous definition** or **circular definition**. For example, we commit this fallacy when we define 'man' as 'a *human* being,' 'life' as 'a *vital* force,' a 'plant' as 'a *vegetable* organism,' a 'judge' as 'a lawyer who exercises *judicial* functions' or 'just' as 'one who practices *justice*.'

4. The definition should be clearer than the term defined, that is, it should not contain obscure, figurative or ambiguous language. The violation of this rule gives rise to the fallacy of **Obscure or figurative definition**.

Examples :—

Figurative definitions : Camel is the ship of the desert ; The lion is the king of the beasts ; Bread is the staff of life ; Love is a sickness full of woes ; Youth is the spring of life ; Childhood is the morning of life.

Obscure definitions : A net is reticulated fabric, descussated at regular intervals with interstices and intersections (Dr. Johnson) ; A girl is an oval mass of bent space being thrown off like electrons from swiftly rotating nithilowatts with all the speed of idiols (Einstein) ; A periphrasis is a circumlocutory cycle of oratorical sonorosity, circumscribing an atom of ideality lost in verbal profundity ; Eccentricity is peculiar idiosyncrasy ; Fluency is the exuberance of verbosity.

This rule, however, will not be strictly applicable to scientific definitions expressed in technical language. For, though the scientific definitions are more difficult to under-

stand than the term defined, they state what is more important from the scientific point of view. Besides "what is obscure to one man may be clear to another, and accordingly, in order to determine whether or not a definition is obscure, we must take into account the context in which it is made. Mathematical and scientific definitions may be perfectly sound, though they may be unintelligible to a man who knows nothing of mathematics or science" (Latta and Macbeth).

V. The definition should as far as possible be expressed by positive rather than by negative terms. We must not define things by their contraries or contradictories. The violation of this rule leads to the fallacy of **negative definition**. Examples :

Knowledge is the opposite of ignorance ; Virtue is the opposite of vice ; Light is not darkness ; Mind is not matter ; Peace is the absence of war.

If the term to be defined be itself negative, negative definition may be considered as valid. For example, Bachelor is 'an unmarried man ; Indivisible is that which cannot be divided. But even in such cases preference should be given to affirmative definition if it is possible. For the aim of definition is to make the meaning of a term clear. But a negative definition instead of telling us what a term means tells us what it does not mean.

4. Limits of Definition.

There are certain terms which cannot be defined :

(a) *Summum Genus* cannot be defined because it has no higher genus of which it can rank as species. Thus 'thing' is undefineable.

(b) *Singular Abstract Names*—such as equality, squareness, redness, duty, cannot be defined because they imply simple attributes which cannot be further analysed into simpler attributes.

(c) *Proper Names* cannot be defined because they are devoid of connotation.

(d) *Individual Objects* cannot be defined because they possess an infinite number of attributes, which cannot all be enumerated. Thus 'this table' and 'that tree' cannot be defined though 'table' and 'tree' as class names can be defined.

(e) *The names of simple unanalysable feelings*, such as *pain* or *pleasure* cannot be defined, because they are purely subjective. One can feel pleasure and pain, but cannot exactly define them in words.

It may be noted that technical and scientific terms such as triangle, syllogism, comet, typhoid, sonnet, etc., in which the reference to attributes is more prominent can be defined more easily than the names of familiar objects such as net, pen, dog, chair, etc., in which the reference to objects is more prominent.

5. Criticism of the traditional view of definition.

The limits of definition, we have just pointed out reveal the defects of the traditional view of definition. If we define a thing by enumerating its qualities, we must further define each of those qualities by another set of qualities, and so on, till we arrive at certain qualities which cannot be defined. Similarly, if we define a thing *per genus and differentiam*, we must define the genus by another genus and differentia till we reach a *summmum genus*, which cannot be defined. Besides this involves a lengthy analysis of the meaning of the term to be defined and leads to confusion, whereas the aim of definition is to secure distinctness in our

ideas.* These defects are involved in the fundamental assumption that definition consists in enumeration of qualities, which are isolated or externally related. "Scientific definition does not consist in an enumeration of qualities. Its aim is really to show the position of the thing defined in one or another system, i.e., its relation to other elements in the system and to the system as a whole. On this view nothing is indefinable. 'Red' is defined by its place in the system of pure colours. 'Being' and 'quality' are defined by their positions in the system of categories, which include such other elements as substance, 'relation,' 'quantity' etc. " (Latta and Macbeth: "The Elements of Logic")

6. Definition and Description.

Definition is the statement of the *essence* or the full and precise connotation of a term. But description is the bare statement of some accidental qualities such as the form, colour or the parts of the object. For example we may describe the camel as having a long neck, a house as No. 23, Drummond Road, an individual as having a bald head. Sometimes the description may include even a part of connotation. For example 'man' may be described as 'a featherless *animal* that cooks his food and occasionally claps his hands.'

The purpose of definition is to give a clear and distinct idea of the meaning of a term; while the purpose of description is just to enable us to distinguish a thing from other things. Definition is scientific while description is popular. Definition appeals to thought while description appeals to imagination. Definition is concerned with names and concepts while description is concerned with objects.

*To avoid this the traditional view assumes that the proximate genus and differentia by which a term is defined are already distinct.

It is not possible, however, to draw a sharp line between definition and description. The same proposition may sometimes be definition from one point of view and description from another. Description is really an imperfect attempt at definition. Recourse is usually had to description when definition is not possible.

7. Value of Definition.

Definition is useful in the following respects :—

(a) It contributes to the clearness and distinctness of our ideas, and thus makes clear and consistent thinking possible. Fallacious thinking is very often due to ambiguity of language and ideas which are not distinct.

(b) It is of particular value to science, because it reveals the very essence of things. The ultimate end of a science is to define the objects it studies.

(c) It helps us to avoid Tautology. Tautology is usually due to the fact that the meaning of terms used is not clearly understood.

8. Exercises worked out.

Question :—1. Test the following definitions :—

(a). *A dog is a domestic animal.*

Answer: 'Domestic' is not the differentia of 'dog' but only an accident. Hence the definition is *accidental*. It is also *too wide*, because it applies to many other animals such as 'cow', 'horse' etc.

(b) *A pump is a water-raising machine, worked by a handle.*

Answer: This definition is *too narrow*, because it excludes the pumps which are not worked by a handle e. g., the steam pumps.

(c) *A poet is an apostle of sweetness and light.*

Answer: This is a *metaphorical definition*.

(d) *A scribe is a writer.*

Answer: This is a *synonymous definition*, because the subject and the predicate are identical in meaning.

(e) *Tranquillity is the absence of unrest.*

Answer: This is a *negative definition*. It does not tell us what tranquillity is but what it is not.

(f) *A giraffe is a quadruped which feeds on the foliage of tree and has long-legs and a very long neck.*

Answer: This is an *accidental definition* or a mere description.

(Holman and Irvine)

Question 2. Examine the following definitions:—

(a) *Death is an undisturbed ever-lasting sleep.*

Answer: This is a *figurative definition*.

(b) *A gentleman is a person without any obvious means of livelihood.*

Answer: This is an *accidental definition*.

(c) *A proposition is a sentence containing a subject and a predicate and forming part of a syllogism.*

Answer: This is an *accidental definition*, because it mentions parts of 'proposition' and its accident. 'Subject' and 'predicate' are the parts of 'proposition' and not its attributes, while 'forming part of a syllogism' is its accident.

EXERCISE VII

1. What is a logical definition? Distinguish between definition and description. Give examples. Are there any indefinables? If so, why? (P. U. 1932)

2. Explain fully the nature of definition *per genus et differentium*. Define the following terms by stating the genus and differentia in each case:—

Logic; Syllogism; Genus; Sorites; Conversion; Contrariety; Dilemma; Mood. (U. P. B. I. F. (1940)

3. Enumerate with examples, the rules of Logical Definition, indicating the fallacies which arise from their violation. State and illustrate the limits of definition. (C. U. 1937)

4. State and illustrate the logical rules of a sound Definition and determine the relation of Definition to the predicables. (C.U.)

5. Explain the nature and function of Definition. Are there any terms which cannot be defined? Give reasons for your answer. (U. P. B. I. E. 1942)

6. Examine the following definitions:—

- (a) A gentleman is a man who moves in good society.
- (b) Time is the moving image of eternity.
- (c) Rust is the red desquamation of iron.
- (d) Paper is a substance made of rags.
- (e) Man is a bundle of habits.
- (f) Logic is a mental science.
- (g) Man is a self-conscious being.
- (h) Silver is a metal less valuable than gold.
- (i) A square is a four-sided figure whose four sides are equal and whose angles are right angles.
- (j) Civilization consists in eating with a knife and a fork.
- (k) Politeness is the oil that lubricates the wheels of society.
- (l) Mercury is not a solid metal.
- (m) King is one who possesses regal powers.
- (n) Life is the continuous adjustment of inner to outer relations.
- (o) Oxygen is a gas.
- (p) Black is the opposite of white.
- (q) A citizen is a man who pays taxes.
- (r) Virtue is acting rightly.
- (s) The sun is the centre of the solar system.
- (t) Music is an expensive noise.
- (u) A student is a youth attending an educational institution with books.

CHAPTER VIII

DIVISION .

1. General Character of Logical division.

Logical division is the splitting up of a class into its constituent species or sub-classes. As definition is the exposition of the *connotation* of a term, so division is the exposition of its *denotation*. But the analysis of a class into the individuals constituting its denotation is *not* logical division. It is simply *Enumeration*. Thus it is clear that *only a class can be divided* and also that the *members of a division must themselves be classes*. The class which is divided is called *totum divisum* and the constituent sub-classes are called the *membra dividantia* or *dividing members*.

Division is distinguished from Physical Partition which is the splitting up of a thing into its constituent parts ; e.g., 'man' into head, arms, legs, chests, etc., 'house' into roof, ground-floor, first-floor, etc ; 'plant' into trunk, roots, branches, leaves, etc.

Division is also distinguished from Metaphysical analysis or Division, which consists in the splitting up of a thing into its attributes : e.g., 'gold' into 'yellowness,' 'a particular lustre,' 'specific gravity' etc. 'man' into 'animality' and 'rationality.'

It is obvious that a class of which the members are absolutely alike cannot be divided. For example, coins of the same type and date and issued from the same mint cannot be divided. Division is possible only by difference.

If we want to divide a class, we must find out some attribute which is possessed by some members of the class and not by others i.e., a separable accident. Such an attribute is called **Fundamentum divisionis**, i.e., the principle of division, because it serves as the basis for the process of division. Thus on finding that some men are educated while some or not, we may take 'education' as the principle of division and divide men into 'educated' and 'uneducated.' Similarly taking 'equality of length of sides' as *fundamentum divisionis* we may divide 'triangles' into three sub-classes: equilateral, with all the three sides equal; isosceles, with only two sides equal; scalene, with no sides equal.

The same class may be divided in various ways according as we take different principles of division. For example, 'Men' may be divided on the basis of colour, caste, creed, age, occupation etc. When the same class is thus divided in different ways the process is called *Co-division*.

The process of division may be continued. A class may be divided into its sub-classes, and the latter may again be divided into their constituent sub-classes. Such a process is known as *Sub-division*. This process may go on till we reach *infima-species* which cannot be further divided into sub-classes. But every step of sub-division must have a new *fundamentum divisionis*. Thus, having divided 'triangles' into equilateral, isosceles, and scalene on the basis of *equality of sides*, we must change the basis of division, if we want to further divide any of the sub-classes; for instance, we may further divide isosceles triangles on the basis of the size of their angles into right-angled-isosceles, obtuse-angled-isosceles and acute-angled-isosceles.

2. Rules of Logical Division.

The following rules may be laid down for logical division :—

Rule 1. Each act of division must have only one basis, or fundamentum divisionis, viz., the presence of a particular attribute in some members of the class and its absence in others. The violation of this rule gives rise to the fallacy of *Cross Division*, i.e., a division in which various principles of division cut each other or are confounded. For example, the division of 'Man' into tall, white, educated and Asiatics, involves four principles of division i.e., size, colour, education and race; the division of 'triangles' into equilateral, scalene, right-angled and acute-angled involves two principles of division, i.e., 'equality of sides' and variety of angles. The aim of division is to make the denotation of a term clear and distinct by dividing it into its constituent species. If the division is based on more than one principle of division, this purpose is not served, since the *species are confused one with the other*.

Rule 2. The dividing members or the sub-classes must be mutually exclusive, i.e., no member of the class divided should fall into more than one-sub-class. The violation of this rule gives rise to the fallacy of *overlapping Division*. This rule apparently follows from the first. If a division is based on a single fundamentum divisionis the dividing members must necessarily be mutually exclusive. For example, if we divide 'Triangles' into 'right-angled' and 'non-right-angled,' on the single basis of presence or absence of a right angle the sub-classes must be mutually exclusive, for no triangle can be both right angled and non-

right-angled. But if we divide 'Triangle' on more than one basis into 'equilateral' 'scalene' and 'right-angled' the same triangle may fall into more than one class; it may be both equilateral and right-angled or both scalene and right-angled. There is, however, some justification for regarding this as an independent rule, for though every case of overlapping 'division' is also a case of 'cross division,' every case of cross division' is not necessarily a case of 'overlapping division' For example, the division of 'Triangles' into 'isosceles' and 'scalene,' involves cross division, but it is not overlapping.

Rule 3. The sub-classes must together be co-extensive with the divided whole. This rule implies that the denotation of the sub-classes taken together should be equal to the denotation of the class divided, neither more nor less. The denotation of the sub-classes is less if the division omits one of the sub-classes. In this case we have the fallacy of *Too Narrow* division, e.g., the division of triangles into equilateral and isosceles, which omits the sub-class 'scalene.' The denotation of the sub-classes is more than the denotation of the class divided, if the division includes some classes which are not contained in the class divided. In this case we have the fallacy of *Too Wide* division, e.g., the division of coins into gold, silver, copper and banknotes.

Rule 4. The division if continued should be step by step. i.e., *in a continued division each step should divide a class or sub-class into its proximate sub-classes.* This implies that division should not make a leap. If the division makes a leap by omitting some intermediate species, it becomes *too narrow* or *disorderly*. If rectilinear plane figures are divided *directly*

into such remote species as equilateral triangles, squares, parallelograms, etc., one or more sub-classes is naturally omitted and we have too narrow division. If, again rectilinear plane figures are divided into triangles, polygons, and *squares*, thus giving two proximate species with one remote species, we have disorderly division.

These are the main rules of logical division. But there are other rules, which follow either from the conception of logical division or from one of the main rules. These may also be mentioned as additional rules, for they are found useful in testing a division and distinguishing it from other processes which are somewhat similar to it.

Additional Rules.

Rule 5. The term divided must be applicable in the same sense to each of the sub-classes i.e., *the whole should be predicable of the part*. For example, the term 'triangle' is applicable in the same sense to each of the sub-classes, viz., equilateral, isosceles and scalene. This rule is a corollary from Rule 3. If the name of the class divided is not applicable in the same sense to each of the sub-classes, it is obvious that the denotation of the sub-classes taken together will not coincide with the denotation of the class divided. The violation of this rule sometimes leads to the fallacy of Physical Division or Metaphysical Division. For neither in meta-physical division nor in physical division the name of the thing divided is applicable in the same sense to any of the parts or attributes into which it is divided.

Rule 6. The term divided must be a common term. This rule follows from the definition of logical division, for logical division is always of a class and not of an

individual. This characteristic distinguishes logical division from the Physical Division or Metaphysical Division.

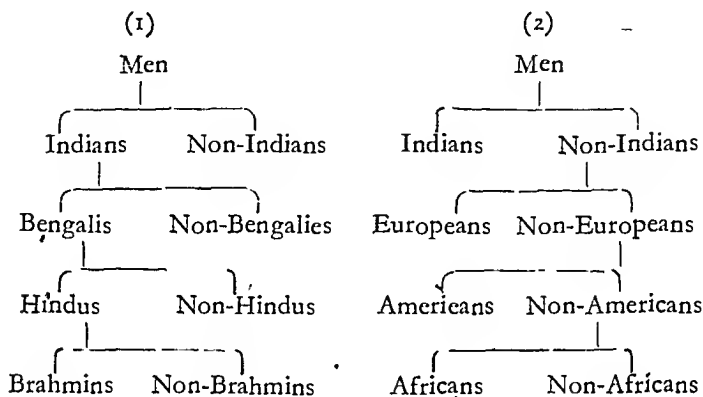
Rule 7. Each member of the division must be a common term. This rule also follows from the definition of Division. Logical division is the division of a class into *sub-classes* and not into individuals. This distinguishes Division from the process known as Enumeration.

3. Division by Dichotomy.

According to the rules of logical division, the sub-classes must not overlap and when taken together they should be equal to the class divided. We cannot ascertain whether a particular division conforms to these rules or not without a thorough knowledge of the things divided. But in formal logic we are not supposed to have the Knowledge of the things as such. Therefore formal logicians have introduced the Division by Dichotomy in which, it is supposed, the rules of division are observed without any knowledge of the things divided.

Division by Dichotomy (dividing or cutting into two) means the division of a higher class at each step into two sub-classes, one of which possesses a given attribute while the other does not. It is division by means of a pair of contradictory terms. At each step we have two sub-classes. One is positive and the other is negative. The whole process is based on the Principles of Contradiction and Excluded Middle. According to these principles the two sub-classes must be mutually exclusive and taken together should be equal to the denotation of the class divided. As the two sub-classes at each step are based on the presence and absence of a single attribute there cannot be more than one

principle of division. Division by dichotomy may be illustrated by the following examples :—



This kind of division is chiefly valuable as a test of the completeness of a division. It does not however overcome the difficulties it was devised to meet and is open to the following objections :—

(1) At each step we have to depend on our material knowledge for finding out a really suitable fundamentum divisionis. The process itself does not guarantee that the attribute we select as the basis of division is one which can lead to a real division i.e., which is a separable accident of the class to be divided. Thus according to division by dichotomy the division of men into feathered and non-feathered or into rational and non-rational will be correct.

(2) It does not secure exhaustiveness. The process is almost unending. There is nothing to guarantee that the class at which we stop is the limit, beyond which the division cannot proceed.

(3) The sub-class denoted by the negative term is very indefinite and vague.

(4) The process does not guarantee the existence of any of the sub-classes. At least the existence of the sub-classes denoted by the negative term is always hypothetical. How can we know without an appeal to our material knowledge whether some men are non-Indians or non-Europeans.

(5) It is too cumbrous. It is unnatural to divide a class into two sub-classes only when it clearly includes other classes.

(6) It places co-ordinate species in the wrong place, thus giving us the impression that they are sub-ordinate to one another. Thus Indians, Americans and Africans are co-ordinate species of 'man,' but the way in which they are arranged in dichotomous division suggests that they might be sub-ordinate to each other.

4. Division and Definition.

Both division and definition aim at making the meaning of terms clear and definite, division by unfolding their denotation and definition by unfolding their connotation. Thus *division and definition are complementary to each other.*

Division and definition imply each other. In dividing we define and in defining we divide. When, for instance, we define 'man' as 'rational animal,' we implicitly divide animals by dichotomy into 'rational' and 'non-rational' for the definition clearly suggests that there are other kinds of animal who are not rational. Similarly a division by dichotomy supplies us with a definition per genus et differentiam. When we divide 'animals' into rational and non-rational, the dividing members are automatically defined, for the principle of division serves as their differentia and the class divided as

their genus. Thus in defining a species we divide its genus in dividing a genus we define its species.

Also *division and definition help each other*. Division is not possible unless we have some idea of the connotation of the species into which we divide a class, viz., unless we define the species, howsoever vaguely, for it is only with the help of such definitions that we can arrive at a *fundamentum divisionis*. Division, on the other hand, gives a clear idea of the common and essential qualities of a class by splitting it up into its constituent species, and thus it helps definition.

5. Limits of Division.

Logical division is not possible in the case of

(a) *Infima species*: because it cannot be split up into narrower classes.

(b) *Individual Objects*, because their division leads to physical partition or metaphysical division.

(c) *Ultimate Experiences* such as pleasure and pain, because they cannot be divided into more elementary experiences.

6. Uses of Division.

The uses of division are :

(i) It gives us a definite knowledge of the denotation of general terms and thus makes their application more precise and accurate.

(ii) It is of great value to science, by dividing a wider class into narrower classes it paves the way for specialisation of enquiry and the discovery of secondary laws.

(iii) It enables us to think clearly and systematically. Without division and classification it is not possible to in-

roduce order and harmony in the chaotic mass of our experience.

7. Examples worked out.

Question. Test the following divisions :

- (a) Plants into stem, root, and branches.
- (b) Plane figures into curvilinear and rectilinear.
- (c) Mind into feeling, thinking and willing.
- (d) Man into, white, black, rogues and murderers.
(Holman and Irvine).
- (e) Statesmen into efficient, democratic, imperial, or wealthy.
- (f) Triangles into equilateral, isosceles or right angled.
(Bartlett's Exercises).

Answer : (a) It is not logical division but physical division, because instead of mentioning the constituent species of plants, it only gives their physical parts.

(b) It is a logical division. It is based on a single fundamentum divisionis. The dividing members are collectively exhaustive and mutually exclusive.

(c) This is Metaphysical division. It mentions the attributes of mind and not its constituent species.

(d) Here two principles of division are involved ; colour and morality. It, therefore, commits the fallacy of Cross Division. It is also Overlapping because the same man can be white rogue and murderer.

(e) This division is based on three principles : capacity of doing work, kind of political theory held and possession of wealth. It is therefore, a case of Cross Division. It is also Overlapping because the dividing members are not mutually exclusive. For instance, a statesman can be 'efficient' 'democratic,' as well as 'wealthy.'

(f) It involves Cross Division because it is based on two principles : (i) magnitude of angles and (ii) number of equal sides. On the basis of 'magnitude of angles' triangles can be divided into—acute, obtuse and right-angled. Since the class of obtuse-angled triangles is here omitted, the division from this point of view is Too Narrow. It is also Overlapping because the same triangle may be equilateral as well as right-angled.

EXERCISE VIII

1. What is meant by Logical Division? What are the processes with which it is liable to be confounded? How would you distinguish it from these processes? (U. P. B. 1930)
2. State and exemplify the rules of Logical Division. (C. U. 1904)
3. How are definition and Division related to each other? Point out their use in scientific enquiry. (C. U. 1938., U. P. B. 1929)
4. What is Division by Dichotomy. Discuss its usefulness.
5. Distinguish between logical, Physical and Metaphysical Division. How is logical division related to Predicables?
6. Test the following divisions.—
 - (a) Hindus into rich, poor, religious and learned.
 - (b) Quinine into bitterness and whiteness
 - (c) Chair into seat, back, legs and arms.
 - (d) Metals into white, heavy and precious
 - (e) Terms into singular, abstract and connotative.
 - (f) Human beings into men, women and children.
 - (g) Instrument into knives, scissors, picks and shovels?
 - (h) Logic into Deduction, Induction and Fallacies
 - (i) The world into Asia, Africa and Europe
 - (j) Light into artificial light, sunlight, moonlight, gaslight, and electric light.
 - (k) Sciences into physical, moral and medical
 - (l) Propositions into singular, universal, particular, affirmative and necessary.

CHAPTER IX

PROPOSITION

1. The Nature of Proposition : Judgment Proposition and Sentence.

Judgment is an act of thought connecting two concepts. Whenever we determine the relation of one thing to another, we are said to judge. For example, 'man' and 'rational' are two concepts, but when we think of them in relation to each other we have a judgment—'Man is rational.' When a judgment is expressed in language it is called a Proposition, just as a concept when it is expressed in language is called a Term. A **proposition** may, therefore, be defined as a **judgment expressed in language.** Since every proposition is the verbal expression of a judgment, the term 'judgment' has frequently been used as a synonym for 'proposition.' This is not quite correct for though every proposition implies a judgment, *every judgment is not a proposition.* Only those judgments are propositions, which are actually expressed in language and there are many judgments which are not so expressed.

A proposition is the statement of a relation between two terms. It either affirms or denies a relation between them. It, therefore, consists of three parts—the Subject, the predicate and the copula. The **Subject** of a proposition is the term about which something is stated ; the **Predicate** is the term which is stated about the Subject; and the **Copula**

is the sign of relation (affirmation or denial) between the subject and the predicate. For example, in the proposition 'John is rich,' 'John' is the subject, 'rich' is the predicate and 'is' is the Copula, affirming a relation between the subject and the predicate. In the proposition 'John is not poor,' 'John' is the subject, 'poor' is the predicate and 'is not' is the Copula, denying a relation between the subject and the predicate.

The analysis of the proposition into the subject, the predicate and the copula does not imply that the judgment is merely a process of comparison between two things—that the subject and the predicate stand apart from each other and the copula, functioning as a coupling-link brings them together to form a judgment. This is only one aspect of 'judgment.' It is the aspect which language emphasises. The other aspect is that the *judgment is a unity*. It is *one* act of thought and refers to one single aspect of reality. The true copula is not a link. It is the *thought activity itself*, and the subject and the predicate do not exist separately and prior to it. It is an activity, which is both analytic and synthetic, an *identity-in-difference*.

An important thing to note is that **a proposition is the expression of a truth or falsity**, i.e., it gives us some information which is either true or false. This characteristic distinguishes a logical proposition from a grammatical sentence. Every sentence is not a proposition though every proposition is a sentence. For there are several kinds of sentences of which we cannot say 'This is true' or 'This is false' e.g., the sentences expressed in the form of questions, commands or exclamations. The nearest approach to a proposition is what is known as the *Indicative sentence*. Whately, therefore, described a proposition as 'an indicative sentence.' It is true, however, that many sentences expressed in the form

of questions, commands or exclamations are intended to convey some information, and a proposition is therefore contained in them. The proposition in such cases can be extracted from the sentence by converting it into the strict logical form—subject, copula, predicate. For example the sentence ‘Can the leopard change his spots?’ may be changed into its logical form: ‘Leopard is an animal who cannot change his spots.’ Here ‘leopard’ is the subject ‘is’ is the copula, and ‘an animal who cannot change his spots’ the predicate.

2. The nature of the Copula.

The copula is expressed in the present tense of the verb ‘to be’ and is either affirmative or negative. Thus it may take any one of these forms: *is* or *is not*; *are* or *are not*; *am* or *am not*; and *art* or *art not*.

The copula merely expresses agreement or disagreement between two terms. It does not assert or deny the existence of the subject. This may become clear from the proposition: ‘The golden mountain is a fiction.’ Here the word ‘is’ does not imply that ‘golden mountain exists.’ *It is used merely as a sign of relation* between the subject and the predicate. In some propositions, no doubt, the verb ‘to be’ has the meaning of ‘exists,’ e.g., in the proposition ‘God is.’ But in all such cases ‘is’ includes the copula as well as the predicate and may be expanded into ‘is existent.’ Thus the proposition ‘God is’ means ‘God is existent.’

Mill has expressed the view that the copula may be in any tense. But, as we have already seen, the copula is just a sign of relation between two terms, and as such it has nothing to do with variations in tense. It should always be in the

present tense because whether it refers to the past, present or future, *it expresses a present relation* between the subject and the predicate which are at the moment present before us. Besides, is not truth or falsity independent of time and place? If a relation between two terms is true with regard to a particular time and place it would be regarded as true for all times with reference to that particular time and place. Whenever the copula contains an element of time it should be referred to the predicate. For example, the proposition 'Akbar was a great Moghul King,' should be expressed as 'Akbar is a person who was a great Moghul King.'

Some logicians hold that the copula should always be expressed in the affirmative form, and the sign of negation in a negative proposition should be transferred to the predicate. Thus instead of saying 'John *is not* wise' we should say 'John is not-wise.' This is a very unnatural way of expressing negative judgments. In so far as there is a negative aspect of our ideas the distinction between affirmative and negative proposition to express our true ideas is quite necessary. It is just as natural to think of what a thing *is not* as to think of what it *is*. Moreover the transference of the sign of negation to the predicate makes a proposition rather obscure and unintelligible, because a formally negative predicate applies to an infinite number of widely dissimilar objects.

The logical proposition should always be in the indicative mood. If the copula contains any sign of modality, it should be transferred to the predicate. Thus the propositions 'Two and two *must* be four' and 'India *may* get independence,' should be put in the form: 'Two and two *are* numbers which must be four,' 'India is a country that may get independence.' This procedure has also been criticised by some logicians on

the ground that it involves 'unnecessary circumlocution'. The criticism is not valid in view of the fact that the sign of modality in the copula makes it ambiguous. There are different degrees of possibility and necessity, and the necessity or possibility may be either subjective or objective.

3. Kinds of Proposition.

Propositions may be classified according to different principles thus :—

1. According to Composition.
 - { Simple, e.g., S is P ; S is not P.
 - { Compound, e.g., S as well as R is P ;
 - { Neither S nor Q is P ; S is P and Q ; S
 - { and R are P.
2. According to Relation.
 - { e.g., S is P ; S is not P.
 - { Hypothetical, e.g., If S is
 - { R, P is Q
 - { Conditional { Disjunctive, e.g., S is
 - { either P or Q.
3. According to Quality.
 - { Affirmative, e.g., S is P.
 - { Negative, e.g., S is not P.
4. According to quantity.
 - { Universal, e.g., All S is P ; No S is P.
 - { Particular, e.g., Some S is P ; Some S
 - { is not P.
5. According to Modality
 - { Necessary, e.g., S must be P.
 - { Assertory, e.g., S is P.
 - { Problematic, e.g., S may be P.
6. According to Significance.
 - { Verbal, e.g., Man is rational.
 - { Real, e.g., Man is a cooking-animal.

4. Classification according to composition.

According to composition propositions are divided into Simple and Compound.

A simple Proposition is the expression of a single judgment or a relation between two terms, e.g., 'Man is mortal,' 'Man is not perfect.' A compound Proposition is the expression of more than one judgment. It can be analysed into two or more propositions. Thus, 'James and John are sportsmen' is a compound proposition. It may be analysed into (1) James is a sportsman, and (2) John is a sportsman. Similarly 'Neither John nor James is a fool' may be analysed into (1) John is not a fool, (2) James is not a fool.

A compound proposition is either *copulative* or *remotive*. A *Copulative* proposition is combination of two or more *affirmative* propositions. A *Remotive* proposition is a combination two or more *negative* propositions. Of the two examples of compound Proposition given above, the first is Copulative and the second is remotive.

5. Classification According to Relation.

According to the kind of relation existing between the subject and the predicate, propositions may be divided into 1. Categorical and 2. Conditional. **A Categorical Proposition is one which makes a statement without any condition**; e.g., Man is mortal; Fire is hot. **A Conditional Proposition is one which makes a statement subject to some condition.** For example, 'if John is invited he will come.' Here the statement 'John will come' is made under the condition 'If he is invited.'

Conditional Propositions are sub-divided into 1. Hypothetical and 2. Disjunctive.

A Hypothetical Proposition is a conditional proposition in which the condition is fully expressed by means of the conjunction 'if' e.g., 'If there is storm, the clouds will disappear,' 'If it rains, the ground will be wet.' Sometimes the condition is not introduced by the conjunction 'If' but by some other words equivalent to it, e.g., 'When the sun rises, there is light,' 'Where there is smoke, there is fire,' 'Had the train not been late, I would have reached in time.' But all these propositions can be reduced into the logical 'if-then,' thus: 'If the sun rises, then there is light,' 'If there is smoke; then there is fire; If the train had not been late, then I would have reached in time.'

In a hypothetical proposition the part which expresses the condition is called the **antecedent**, and the part which contains the statement is called the **consequent**. In the strictly logical form the antecedent precedes the consequent. For this reason a proposition in which the consequent precedes the antecedent is not regarded as logical unless the order of the antecedent and the consequent is reversed. Thus the proposition 'I shall buy a car, if I have money' is not in the logical form. When reduced to the logical form it would be expressed as 'If I have money, I shall buy a car.'

The antecedent of a hypothetical proposition corresponds to the subject of a categorical proposition and the consequent of a hypothetical proposition corresponds to the predicate of a categorical proposition. Thus it is possible to reduce a hypothetical proposition to the categorical form and a categorical to the hypothetical. But since this kind of reduction is a form of Immediate Inference, we shall deal with it fully in the chapter on Immediate Inference.

A Disjunctive Proposition is a conditional proposition in which the condition is not explicitly stated, but it is implied in an alternative assertion, of which the two members are disjoined by 'Either-Or' e.g., 'A is either B or C'; John is either a fool or a knave'; 'Either he will go or I will go.' Each of the three propositions implies at least two hypotheticals. For example the proposition, 'John is either a fool or a knave' implies.

(1) If John is not a fool, he is a knave.

(2) If John is not a knave, he is a fool.

According to *Uberweg* not two but four hypothetical propositions are implied in a disjunctive statement. But this also we shall discuss more fully in the chapter on Immediate Inference.

*6. Classification according to Quality.

According to *quality* propositions are divided into *Affirmative and Negative*. An Affirmative Proposition is one in which the predicate is affirmed of the subject e.g., John is an Englishman. A Negative Proposition is one in which the predicate is denied of the subject e.g., John is not an American. In an Affirmative Proposition the copula is affirmative; in a negative proposition the copula is negative. If the proposition is universal negative the sign of negation is not associated with the copula but with the subject. Thus if we have to deny 'perfection' of 'all men,' we shall not say 'All men are not perfect' (which may imply 'Some men are perfect,' but we shall say 'No men are perfect.'

Some logicians have attempted to abolish the negative form of proposition and reduce the negative proposition into the affirmative form, by transferring the negation to

the predicate. For example, they express the proposition 'John *is not* an American' as 'John *is* not-American. Propositions of this type which have an infinite term as their predicate are called *Infinite Propositions*. We have already seen how the reduction of negative proposition into affirmative is not sound (See Sec. 2.).

The quality of hypothetical proposition depends on the quality of its consequent. If the consequent be affirmative the proposition is affirmative; if the consequent be negative, the proposition is negative.

Affirmative Hypothetical Propositions:—

1. If A is B, C *is* D.
2. If A is not B, C *is* D.
3. If he tries he *will* succeed.
4. If he does not come, I *shall* go.

Negative Hypothetical Propositions:—

1. If A is B, C *is not* D.
2. If A is not B, C *is not* D.
3. If he comes, I *shall not* go.
4. If he does not try, he *will not* succeed.

The quality of the antecedent does not determine the quality of a hypothetical proposition, because it contains only the condition and not the actual statement of relation between the subject and the predicate which is contained in the consequent.

Disjunctive Propositions are always affirmative, because they give a choice of predicates one or other of which must be affirmed of the subject. The proposition of the type 'A is neither B nor C' is not really a disjunctive proposition, but a compound categorical proposition, consisting of two negative categoricals. (1) 'A is not B' and (2) 'A is not C.'

Whether a proposition is affirmative or negative is always determined by its meaning and not merely by the form. Thus the propositions containing such words as *few, hardly, scarcely, and seldom* having a negative force are to be treated as *negative*. For example the proposition ‘*Few men are truly happy*’ is equivalent to ‘*Some men are not happy.*’ But in case such propositions have a negative sign attached to the copula, they should be treated as *affirmative*, because two negatives have an affirmative force ; For example, ‘*Few persons are not greedy*’ is equivalent to ‘*Some persons are greedy*’.

7. Classification according to Quantity.

According to quantity propositions are classified into *Universal* and *Particular*. **A Universal Proposition is one in which a predicate is affirmed or denied of the whole of the subject ; e.g., ‘ All men are animals ; No men are perfect.’** **A Particular proposition is one in which the predicate is affirmed or denied of only a part of the subject ; e.g., Some animals are men ; Some men are not wise.** Thus the quantity of a proposition depends on the quantity of the subject.

The usual signs of quantity used for *universal propositions* which are in the affirmative are the words, **All, Any, Every, Each, Whatever** etc; and for universal propositions which are in the negative the usual signs are **No, None**, etc. The signs of quantity for *particular propositions* are the words **Some, Certain, A few, Many, Most, Not all**, etc.

The word ‘**Some**’ in logic is used in a special sense. In popular language it means ‘more than one but less than all,’ but *in logic it means “at least one and it may be all.”* Thus in ordinary language, the proposition ‘*Some students have*

'failed' will be understood to mean 'More than one and not only one student has failed, and certainly every one has not failed.' But in logic it would mean 'At least one student has failed' and it would not exclude the possibility of all having failed. Ordinarily the proposition 'Some students have failed' implies 'Others have not failed,' but in logic the question of others is left open; all the others may have failed or may not have failed; the proposition does not state anything about them.

Singular Propositions. i.e., propositions having a singular term as their subject are generally regarded as *universal*, if the subject is a definite term e.g., 'John is honest'; 'This man is a thief'; 'That house is mine.' But they are regarded as *particular*, if the subject is an indefinite term, i.e., when it does not refer clearly to some particular individual or group of individuals, e.g., 'A man came to see me'; 'Some one is here,' 'One student fails.'

There are some propositions whose quantity is not clearly stated. These are called **Indefinite** or **Indesignate propositions**. For example the propositions 'Rajputs are brave' 'The Jews are good business men', 'Men are brave,' 'Children are imitative,' are indesignate; because we do not know whether the predication is made of the whole of the subject or a part of it only. Some times however, it is clear from the meaning of an indesignate proposition that the predicate refers to the whole of the subject, as for example 'in the propositions' 'Man is imperfect,' 'Matter gravitates.' Such propositions may be regarded as universal, though *it is safer from the strictly logical point of view to regard all indesignate propositions as particular*

A distinction is sometimes made between **Enumerative Universal** and **Generic Universal Propositions**. Universal propositions which are established by an enumeration of instances i.e., by an examination of a large number of the individual members of a class are called Enumerative Universals, e.g. All crows are black. Universal propositions, on the other hand, which are established on the basis of a causal or necessary relationship between the subject and the predicate are known as Generic Universal propositions, e.g. All material bodies gravitate.

The quantity of Hypothetical Proposition is determined by the quantity of its antecedent. If the antecedent is, in all cases, followed by the consequent, the proposition is universal; if the antecedent is followed by the consequent in some cases only, it is particular. Thus 'If, in all cases, there is smoke, there is fire,' is a universal proposition; while 'if in some cases, there are clouds, it rains,' is a particular proposition.

Disjunctive Propositions are also universal or particular. For example, 'Every man is either honest or dishonest' is a universal proposition while 'Some examinations are either useless or misleading' is a particular proposition.

8. Classification according to Modality.

Modality is the mode or manner of connection between the subject and the predicate—the degree of certainty or probability with which the predicate is affirmed or denied of the subject. 'A modal proposition is one which states explicitly not merely that the predicate does or does not agree with the subject, but also *how* it does or does not agree with the latter; whether, namely, it is an *necessity* or only a *contingency* that S be P.' (Coffey: The Science of Logic, p. 180).. Thus modality of a proposition has been correctly described as 'a special development of its quality.' Accord-

ing to modality, propositions have been classified into, (1) Necessary, (2) Assertory and (3) Problematic or Probable.

A **Necessary** proposition is one in which the relation between the subject and the predicate is affirmed or denied *due to their very nature*. This means that the relation is *necessarily* true; it can never be otherwise. Thus 'A *must be* B,' 'Two and two *must be* four,' 'Two straight lines of a triangle *must together be* greater than the third' are necessary propositions. The necessary proposition is also called *Apodeictic*.

An **Assertory** Proposition is one in which the relation between the subject and the predicate is affirmed or denied *on the basis of our experience* and not due to their very nature. Thus, 'A *is* B,' 'Crows *are* black' 'Some businessmen *are* dishonest' are assertory propositions.

A **Problematic** Proposition is one in which the relation between the subject and the predicate, though not actually found to be true, is considered probable, e.g., 'A *may be* B' 'He *may be* cured,' 'It *may* rain this evening.'

From the standpoint of formal logic these distinctions do not seem to be acceptable. "The apodeictic judgment differs from the assertory only in the emphasis with which it expresses universal connection. It is, therefore, formally nothing more than an assertory judgment—it only asserts more vigorously. Both judgments claim to be true and both express complete belief. For if the belief in the assertory judgment were not as strong as in the apodeictic the former would contain an element of doubt, and would be merely problematic." (Welton, Mannel. I p. 194). It is not possible to distinguish between an assertoric judgment and a categorical one, both being in the form 'S is P.' Again, there is confusion between problematic and apodeictic judgments because it is not possible to discriminate between the different degrees of possibility and necessity, and the

Universal Affirmative. All S is P. (A)

Universal Negative. No S is P. (E).

Particular Affirmative. Some S is P. (I)

Particular Negative. Some S is not P. (O)

S and **P** here stand for the subject and the predicate and the four kinds of propositions are represented respectively by the symbols **A, E, I, O**. The vowels A and I, denoting the two affirmatives occur in the Latin word *Affirmo*, while the vowels E, and O, denoting the two negatives occur in the Latin word *Nego*. These four kinds of proposition are the standard logical forms of categorical proposition and every proposition, whatever its form, must fall under one of these. In examining a certain proposition we have first to reduce it to one of these forms.

11. Reduction of Sentences into Logical Form.

In reducing a sentence to its logical form we have to bring out the copula and express it separately with or without the sign of negation 'not,' if it is not already thus expressed, and to place the subject and the predicate in their proper places, (the subject preceding the copula and the predicate following it) with the proper sign of quantity attached to the subject. For example, the proposition 'Unhappy lies the head that wears the crown' is to be expressed as 'All persons that wear the crown *are* persons who lie unhappy.' The copula is invariably detached from the meaning of the verb, its tense and modality, etc., all of which are transferred to the predicate.

With regard to the quality and quantity of propositions the following suggestions should be carefully noted:—

(1) Propositions beginning with **All, Every, Any, Each**, should be treated as *Universal* if they be in the *affirmative*, but as *particular* if they be *negative*. For example :

1. *Every* young man likes to marry = All young men are persons who like to marry. **A.**

Every young man does not like to marry = Some youngmen are not the persons, who like to marry. **O**

2. *Anyone* can become a pilot = All persons are those who can become pilots. **A.**

Anyone cannot become pilot = Some persons are not those who can become pilots. **O.**

(iii) *Each* of the students is guilty = All the students are guilty.

Each of the students is *not* guilty = Some students are not guilty. **O.**

(iv) *All* is *not* gold that glitters. = Some things that glitter are not gold. **O.**

(2) Propositions with their predicates qualified by **Always, Absolutely, Necessarily** are to be treated as *universal* if they be *affirmative*, but as *particular* if they be *negative*.

For example.

(1) Students are *always* fond of cinema = All students are fond of cinema. **A.**

(2) Students are *not always* fond of cinema = Some students are not fond of cinema. **O.**

(3) Virtuous are *necessarily* happy = All virtuous persons are happy. **A.**

3. Propositions with **Some, Most, Certain, Several, A few, Sometimes, Generally, Mostly, Frequently, Nearly Always, Occasionally**, etc., are to be taken as *particular*—**Negative (O)** if there is a sign of negation, **Affirmative (I)** if there is no sign of negation.

Examples :

(1) *Most* of the men hanker after money = Some men are persons who hanker after money. I.

(2) *A few* books have been stolen from the library = Some books are things which have been stolen from the library. I.

(3) *Several* students did not pass the preliminary examination = Some students are not persons who passed the preliminary examination. O.

(4) Honest people *often* come to grief = Some honest people are persons who come to grief. I.

(5) Prophets *mostly* come from the East = Some prophets are persons who come from the East. I.

(6) Students *frequently* neglect their lessons = Some students are persons who neglect their lessons. I.

(7) White cats with blue eyes are *generally* deaf = Some white cats with blue eyes are deaf. I.

(8) Black cats with blue eyes are *not generally* deaf. = Some black cats with blue eyes are *not* deaf. O.

Propositions of the form 'Most S are P,' are called *Plurative*, for though most is logically equivalent to 'some' it definitely implies 'more than half.'

(4) **Few, Hardly, Scarcely, Seldom** have a negative force. Hence propositions containing these words should be treated *as negative if there is no sign of negation*, but as *affirmative if there is a sign of negation*, because two negatives possess an affirmative force. *Examples :*

(i) *Few* men are pure at heart = Some men are not pure at heart. O.

Few men are *not* selfish = Some men are selfish. I.

(ii) Sinful persons are *seldom* happy = Some sinful persons are not happy. O.

Wicked persons are *not seldom* prosperous = Some wicked persons are prosperous. I.

5. Exclusive Propositions.

An exclusive proposition is one in which the predicate applies to the subject and to nothing else. Marks of an exclusive proposition are such words as 'Only', 'Alone', 'None but', 'No one else but.' An exclusive proposition may be reduced to A, E, or I forms.

We get the A form *by inverting the subject and the Predicate*

We get the E form *by changing the subject into its contradictory*:

We get the I form *directly*.

Examples.

(i) *None but* the brave deserve the fair.

Logical forms: (a) All person's who deserve the fair are brave. A

(b) No non-brave persons are persons who deserve the fair. E.

(c) Some brave persons are persons who deserve the fair. I.

(ii) *Only* the virtuous are happy.

Logical forms: (a) All happy men are virtuous. A.

(b) No non-virtuous men are happy. E.

(c) Some virtuous men are happy. I.

(iii) Graduates *alone* are eligible for the post.

Logical Forms: (a) All those who are eligible for the post are graduates. A.

(b) No non-graduates are eligible for the post. E.

(c) Some graduates are eligible for the post. I

In reducing an exclusive proposition to its logical form the universals A and E are preferred to the particular I.

6. Exceptive Propositions.

An Exceptive Proposition is one in which the predication is made about the whole subject with some exception. Save, But, Except are the marks of an exceptive proposition. An exceptive proposition is to be treated

As Universal, *If the exceptions are definitely specified;*

As Particular, *if the exceptions are not definitely specified.*

Thus the proposition 'All metals *except mercury* are solid' is universal, because the exception here is specified (Mercury); but the proposition 'All metals *except one* are solid' is particular, and equivalent to 'Some metals are solid, because the exception here is not specified.'

7. Impersonal Propositions.

An Impersonal Proposition expresses a fact of experience which is referred to some general reality vaguely conceived. In reducing such a proposition to its logical form we have to *supply the subject from experience.*

Examples. :—

(i) It rains. = The weather is rainy

(ii) It is hot. = The weather is hot.

(iii) It is night. = The time is night.

(iv) It thunders. = The atmosphere is thundering.

8. Singular Propositions.

A Singular proposition is to be treated

As Universal, *If the subject be a singular definite term.*

e.g. Hitler is dead.

As Particular, *if the subject be a singular indefinite term,*

e.g., One Nazi leader is dead.

9. Indesignate Propositions.

We have seen that indesignate propositions are *generally*

treated as particular. But statements containing universal truths may be treated as universal.

Examples :

Indians are born philosophers. = Some Indians are born philosophers. I.

The Rajputs are brave. = Some Rajputs are brave. I

Men are imperfect. = All men are imperfect. A.

Birds have two wings. = All birds are creatures, which have two wings. A.

10. Interrogative Sentences.

Interrogative sentences cannot generally be reduced to the logical form because they do not contain any judgment. But those interrogative sentences which imply a judgment by suggesting their own answer can be reduced to the logical form. For example :

(i) Am I going to stoop so low ? = I am not a person who is going to stoop so low.

(ii) Am I not a man ? = I am a man.

(iii) Do not Indians have any self-respect ? = Indians are men who have self-respect.

11. Are these suggestions exhaustive ?

The four-fold scheme of propositions is like Procrustes' bed into which every proposition must somehow be made to fit. There is no doubt that in this process the propositions lose their artistic simplicity and charm, and sometimes assume a very clumsy and cumbrous appearance, but we are not to worry about this so long as it leads to accuracy of thought and correct elucidation of the meaning of a judgment. The above suggestions will be found useful in this direction, but we are not to take them as exhaustive rules for reducing any kind of statement into its logical form. Our real guide is *the meaning of a statement* which

must be clearly understood, and which *must remain the same* while the form of its expression is changed.

12. Distribution of terms.

A term is distributed when it is taken in its entire extent or denotation ; it is undistributed when it is taken only in part of its denotation.

An A proposition distributes the subject only. It may be shown thus :

An A Proposition is of the form 'All S is P.' It is clear from the mark of quantity 'All,' which is attached to the subject that it is taken in its entire denotation. But there is nothing in the form of the proposition to tell us whether the predicate is taken in its entire denotation or not. The predicate may be taken in its entire denotation as in the proposition 'All men are rational animals.' In this case 'All S is P' is equivalent to 'All S is all P.' Usually, however, the predicate is taken only in part of its denotation as, for example, in the proposition 'All men are animals.' Here 'All S is P' is equivalent to 'All S is some P,' the denotation of 'animals' being greater than that of 'men.' Since we cannot say from the mere form of a proposition without referring to our material knowledge whether the predicate is taken in its entire denotation or not, we conclude that an A proposition does not distribute its predicate.

An E proposition distributes both the subject and the predicate. It may be shown thus :

An E proposition is of the form 'No S is P.' It is obvious that the subject is taken in its entire denotation. The proposition means that no part of the denotation of S falls within P or that S falls *wholly* outside of P, which

naturally implies that no part of the denotation of P falls within the denotation of S or that P falls *wholly* outside of S. Thus the predicate also is taken in its entire denotation.

An I proposition distributes neither the subject nor the predicate. It may be shown thus :

An I proposition is of the form 'Some S¹ is P.' It is obvious that the subject is taken in a part of its extent. The quantity of the predicate is not explicit. It may refer to the whole of the class, as in the proposition 'Some animals are men,' or it may refer to a part of the class, as in the proposition 'Some men are animals.' Hence we cannot say that the predicate is taken in its full extent.

An O proposition distributes the predicate only. It may be shown thus :

An O proposition is of the form 'Some S is not P.' It is clear that the subject of the proposition is not distributed. The quantity of the predicate is not explicitly given. But although it is so, we can say with certainty that the predicate is taken in its entire extent. For, whether we deny the predicate of a part of the subject or the whole of it the denial will not have any meaning unless the predicate is taken in its entirety. The denial is always a complete denial so far as that part of the subject to which it refers is concerned. For example, if it is stated that 'Some works of Shakespeare are not in this library' it is clearly implied that the class of 'books in this library' has been looked *all through*, otherwise how could it be said that the 'Some works of Shakespeare' referred to do not belong to that class.

To sum up :

All Universal Propositions distribute the subject.
All Negative Propositions distribute the predicate.

13. Quantification of the Predicate.

Sir William Hamilton held that although the quantity of the predicate is not explicitly given in a proposition, it is always given clearly in thought. He, therefore, suggested the quantification of the predicate. Thus by taking into account the quantity of the predicate, we get eight propositions instead of the traditional four. The eight propositions together with the symbols which have been devised for them are as follows :—

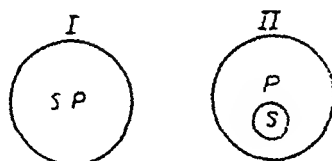
Toto-total Affirmative	. . . . .	All S is all P....(U)
Toto-partial Affirmative	. . . . .	All S is some P....(A)
Parti-total Affirmative	. . . . .	Some S is all P.....(Y)
Parti-partial Affirmative	. . . . .	Some S is some P....(I)
Toto-total Negative	. . . . .	No S is any P....(E)
Toto-partial Negative	. . . . .	No S is some P....(N)
Parti-total Negative	. . . . .	Some S is not any P....(O)
Parti-partial Negative	. . . . .	Some S is not some P....(W)

The quantification of the predicate has the advantage of reducing every affirmative proposition to an exact equation between the subject and the predicate ($S=P$), and thus simplifying conversion and syllogistic inference, but it is needlessly cumbrous. Besides in the ordinary form of proposition the subject is used in extension and the predicate in intention, which makes the quantification of the predicate rather unnatural.

14. Diagrammatic representation of propositions :—

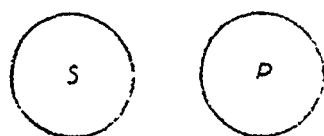
Propositions are often represented by means of diagrams. The scheme of diagrams which is most commonly employed is the one formulated by Euler, a Swiss logician of the eighteenth century. The scheme is given below.

An A proposition is represented thus :—



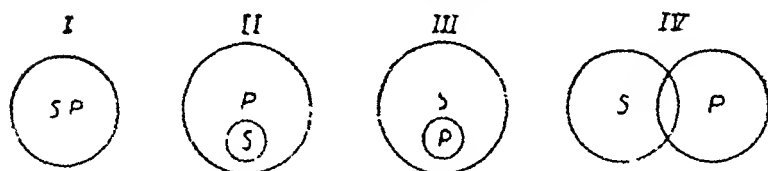
The proposition All S is P may mean (i) The denotation of S is the same as that of P as illustrate by figure I or (ii) The denotation of S is included in that of P, as illustrated by figure II.

An E proposition is represented thus :



The proposition 'No S is P' means that the classes represented by S and P are absolutely outside each other.

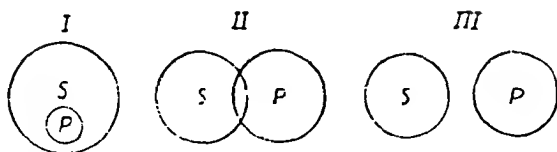
An I proposition is represented thus :



The proposition 'Some S is P' may be interpreted in the following four ways, taking into account the fact that the word 'Some' does not logically exclude 'all' :

1. All S is all P, which is represented by figure I
2. All S is some P, which is represented by figure II
3. Some S is all P, which is represented by figure III
4. Some S is some P, which is represented by figure IV

An O proposition is represented thus :



The proposition 'Some S is not P' may be interpreted in the following three ways :—

1. Some S is not any P, which is represented by figure I
2. Some S is not some P, which is represented by figure II
3. No S is any P, which is represented by figure III

It has been questioned whether propositions can be adequately represented by means of diagrams. Thought relations are varied and complex. How far can they be expressed by means of space relations implying simply inclusion or exclusion? Hypothetical, Disjunctive and Modal propositions express relations, which, it is obvious, the diagrams cannot describe. It should, however, be noted that the diagrammatic representation of propositions is based on the denotative view of their import. It is, therefore, very helpful in elucidating the meaning of propositions when their denotative interpretation is adopted. Its value to the beginners in logic can hardly be denied.

15. Exercises worked out.

Question. Express the following sentences in strict logical form :—

1. Not all Rajputs are brave.
2. Few men are happy.
3. All the students did not pass.
4. All my days are a burden to me.

5. All but John passed.
6. He who would succeed must work.
7. There was bicycle accident in the street just now.
8. Go to hell!
9. Only the students are admitted to this show.
10. Anybody can do it.
11. There is no Indian who is no self-respecting.
12. All but a few died.
13. All that glitters is not gold.
14. It is the cowards who die many times.
15. Times are changed.
16. Seventy per cent of the students passed.
17. The cowl does no make the monk.
18. One may smile and smile and be villain.
19. It is 100 miles from Delhi.
20. If a man is attacked with cholera he may die.
21. Where luck is wanting diligence availeth not.
22. Hardly any scientist is very religious.
23. Those who succeed by chance are few.
24. John and Jim alone are responsible for this theft.
25. We know no principle but honesty.
26. All your answers but three are correct.
27. A little learning is a dangerous things.
28. What rogue would trust a rogue.
29. There are many graduates unemployed.
30. Opinions differ.
31. What I have written I have written.
32. Men are generally prudent.
33. No news is good news.
34. It is better to have loved and lost than never to have loved at all.

35. Me miserable !
36. Not to go on is to go back.
37. All but he (Casabianca) had fled from the burning deck.
38. It is cloudy.
39. Every swan is not white.
40. The conclusions must follow the weakest parts.
41. The more the merrier.
42. Ram likes mangoes as well as apples.
43. Neither Ram is here nor Mohammad.
44. There are Christians and Christians.
45. It is an ill wind that blows good to no-body.

Answer :—

1. Some Rajputs are not brave.—O. (All) with the sign of negation is equal to 'Some not.'
2. Some men are not happy.—O. (few has a negative force).
3. Some of the students are not students who passed.—O
4. The whole of my life is burdensome to me.—A.
'All' as a quantity mark is distributive in significance, when used collectively it is better to replace it by some other form of words.
5. All persons other than John are persons who passed.—A.

The given proposition is an exceptive one with the exception definitely specified. Hence it should be treated as universal).

6. All persons who want to be successful are persons who must work.—A.
7. What occurred in the street just now is a bicycle accident.—A.

It is assumed that the point of emphasis here is the accident.

8. That you go to hell is my desire...A.

9. This is an exclusive proposition and may be reduced to any of the three forms given below :

(a) No non-students are admitted to this show.—E.

(b) All those who are admitted to this show are students

(c) Some students are admitted to this show....I.

10. All men are men who can do it....A.

11. All Indians are self-respecting....A.

(Two negatives have an affirmative force).

12. Some persons are those who died....I.

The given proposition is exceptive, and the exception is not definitely specified.

13. Some glittering things are not gold... O.

14. (a) No not-cowards are persons who die many times.

...E (b) All persons who die many times are cowards....A.

The proposition really means 'Only the cowards die many times'.

15. The modern age is not the age gone by....E.

16. This is a compound proposition and is equivalent to

(a) "Some students are students who passed."...I, and

(b) "Some students are not students who passed."..O.

17. Some persons wearing the cowl are not persons who make the monk....O.

18. Some smiling persons are villains....I.

19. It is a place which is 100 miles from Delhi....A.

20. This is an indesignate hypothetical proposition. It is equivalent to

"In some cases, if a man is attacked with cholera he may die."—I.

21. In all cases if luck is wanting, diligence is not of any use...A.

22. Some scientists are not very religious...O.

23. Some men are not individuals who succeed by chance.
...O.

24. No persons other than John and Jim are responsible
for this theft. ...E.

25. No principle other than the principle of honesty is
the principle we know...E.

26. Some of your answers are correct...I.

27. Some cases of little learning are dangerous...I.

28. No rogue is a person who would trust a rogue...E.

29. Some graduates are unemployed.—I.

30. Some opinions are different from other opinions...I

31. Nothing written by me is a thing which I shall
ever change or modify...E.

32. Some men are prudent...I.

33. Not to have a news is to have good news...A.

34. All cases of having loved and lost are better than the
cases of not having loved at all...A.

35. My condition is miserable...A.

36. All cases of not going on are cases of going back...A.

37. This is an exclusive proposition. It is equivalent to

(1) All persons who think the fools great are fools
themselves...A.

(2) No non-fools are persons who think the fools
great...E.

(3) Some persons who are themselves fools are per-
sons who think the fools great...I.

38. The weather is cloudy...A.

39. Some swans are not white...O.

40. All conclusions are such as must follow the weakest
parts...A.

41. If the number increases, the merriment will increase...A...

This may be treated as a compound proposition and reduced to two categorical propositions thus :

(a) A given number is enough for merriment...A.

(b) An increase in number is something which will produce greater merriment...A.

42. This is a compound proposition. It is equivalent to

(a) 'Ram is a man who likes mangoes,'...A. and

(b) Ram is a man, who likes apples...A.

43. This is a compound proposition. It is equivalent to

(a) Ram is not here...E.

(b) Mohammad is not here...E.

44. Some Christians are different from others...I.

45. The wind that blows good to nobody is an ill wind...A

EXERCISE IX

1. Distinguish carefully between a judgment, a proposition and a Sentence.

2. What are the various ways of classifying propositions? Explain the nature of the various forms of proposition and give examples. (U. P. B. 1930)

3. Apply the distinctions of Differentia, Property and Accident to explain the difference between the Analytical and Synthetical Propositions. (U. P. B. 1928)

4. Explain and illustrate the following kinds of propositions :—

(a) Hypothetical, (b) Disjunctive, (c) Exclusive, (d) Exceptive, (e) Synthetic, (f) Indesignate. (C. U. 1930)

5. What do you consider to be the precise significance of a Disjunctive Proposition and why?

6. What is the nature of the logical copula? (C. U. 1907)

7. Explain briefly Euler's system of Diagrams. (U. P. B. 1931)

8. Discuss briefly the theory of the Quantification of the Predicate.

9. State the general rules relating to the distribution of terms in propositions. Point out the terms which are distributed in the following propositions :—

- (a) The Earth moves round the sun.
- (b) Only the educated are fit to vote.
- (c) A few drops of rain are not of much consequence.
- (d) Man proposes, God disposes.
- (e) There is at least one student who is not present.
- (f) Most storms are preceded by a fall of the barometers.

10. Express the following in strict logical form, adding the symbols A, E, I or O in each case :—

1. John struck Henry.
2. All who go to church do not pray.
3. God is.
4. Not all the riches of the world can bring happiness.
5. It is certain he died.
6. Any and every man cannot be Mahatma Gandhi.
7. Fire!
8. We cannot all command success.
9. Men alone are rational.
10. Logicians are argumentative.
11. Theft is never justifiable.
12. Go a-borrowing, go a-sorrowing.
13. I do not like to be alone.
14. Faint heart never won fair lady.
15. Many reformers are inconsistent.
16. Phosphorous does not dissolve in water.
17. John and Henry are proper names.
18. John may pass the examination.
19. Few men are acquainted with themselves.
20. A certain king was a philosopher.
21. Few men have not suffered disappointment.
22. Four-fifths of his men died bravely on the battle field.
23. Some student has done the mischief.
24. Things are not what they seem.

25. Busy men seldom indulge in gossip.
26. Honest men are not seldom honoured.
27. Only ignorant persons hold such views.
28. Every graduate is competent to do the work provided he is not physically unfit.
29. When beggars die there are no comets seen.
30. Humour is not given to all.
31. More haste less speed.
32. Few men know how little they know.
33. Nearly all troops have left the town.
34. Any graduate can apply for the post.
35. Most men are not God-fearing.
36. Scarcely any European is unpunctual.
37. A perfect man ought always to be busy conquering himself.
38. Beasts never reason.
39. He is probably the best student of his class.
40. No rains, no good harvest.
41. No Hindu is either fanatic or atheist.
42. It is noble to be good.
43. Humayun was the son of Babar.
44. None but the poor suffer in famine.
45. Not all truths are to be told.

CHAPTER X

IMPORT OF PROPOSITIONS

1. Theories of Predication

What is the import or the real meaning of proposition ?

Our answer to the question depends on the view we hold as to the nature of predication, or the exact meaning of the relation between the subject and the predicate. Different theories of predication have been held according to the different ways in which the meanings of the subject and the predicate, have been interpreted. Since every term has two kinds of meaning, meaning in denotation and meaning in connotation, both the subject and the predicate may be understood in denotation or in connotation. Thus we have four theories of Predication :

1. The Predicative view.
2. The Denotative or class-inclusive view.
3. The Connotative or Attributive view.
4. The Connotative-denotative view.

(1) **The Predicative View.** According to the predicative view, held by Martineau and Venn, the subject is interpreted in denotation and the predicate in connotation. The relation expressed by a categorical proposition is that between a thing and its attribute. Thus in the proposition 'Gold is yellow,' the subject 'gold' refers to the thing called by that name and the predicate to an attribute which is affirmed of it. This view is in agreement with the *psychological and the common sense view*. In making a statement we usually think of the subject as a thing and the predicate

as an attribute. Hence it is that the subject is usually a substantive and the predicate an attribute. This also explains why a word which is primarily an attributive cannot form the subject of a proposition, and why the subject alone is quantified and not the predicate.

The four-fold scheme of propositions is apparently based on this view. The subject refers to some object while the predicate refers to some quality. The latter must either be affirmed or denied of the former. This leads to the distinction of propositions into affirmative and negative. Again the affirmation or denial must be made of either the entire class of things indicated by the subject or a part of it. This leads to the distinction between universal and particular propositions.

(2) **The Denotative or Class-inclusive View.**

According to this view both the subject and the predicate of a proposition are taken in denotation. The proposition expresses whether the class denoted by the subject is included in or excluded from the class denoted by the subject. Thus the proposition 'Gold is yellow' means that the class of things called 'gold' are included in the class of things called 'yellow' and the proposition 'Gold is not white,' means that the things denoted by 'Gold' are excluded from the things called 'white.'

This view is psychologically wrong. We do not usually think of the predicate in denotation. In the proposition 'Gold is yellow' we do not think of 'yellow' as a class of things but simply as an attribute. It is difficult on this view to explain propositions of the type 'It rains' 'Honesty is the best policy' or 'Socrates is the son of Sophroniscus,' in which the subject and the predicate clearly do

not refer to classes but to individuals or to abstract qualities.

This view gives rise to the doctrine of the Qualification of the predicate and leads ultimately to the equational theory of proposition according to which a proposition is always an equation of its subject and predicate, and may be stated in the form $All\ S = Some\ P$, $All\ S = All\ P$ etc. The absurdity of the equational theory has been clearly explained by Mellone. He says "It is not sufficient to say that 'All S is some P,' unless we specify that only S part of P is meant; for on the class view, as the diagrams show, the copula 'is' means 'is identical with.' In saying 'All men are some mortals' we should specify what 'some' is meant: 'Some' stands for the human part of mortals. Hence, looking simply at the side of extension we get the form, "All men are men-mortals," not merely "some mortals"; i.e., the form 'S is SP.' In such a proposition the one side differs from the other only by the addition of P. But if this constitutes the real difference, we must add P to the first side also, in order that the copula may still mean "is identical with" or "coincides with;" that is we must say "SP is SP," "mortal men are mortal men," which is a proposition telling us nothing." Thus the equational theory is the *reductio absurdum* of the denotative view of propositions.

Logically, however, this view is more satisfactory than others. It enables us to understand the proper implication of a proposition. This is borne out by the fact that it is the only view on which diagrammatic representation of proposition is possible. This view helps in understanding the problem of distribution of terms, which is so important in logic. The treatment of Immediate Inference and Syllo-

gistic reasoning finally depends on this. Aristotle's dictum 'Whatever can be affirmed or denied of a whole class can be affirmed or denied of a part of that class,' which underlies the whole of syllogistic reasoning is based on it. Also the names of terms in syllogism—'major term,' 'minor term,' and 'middle term,' indicating primarily the extent of their application, show how syllogistic reasoning rests primarily on this.

This is the only view on which propositions relating to classification can be satisfactorily interpreted. Hence Latta and Macbeth have remarked "If classification is taken as the ideal science, i.e., if it is supposed that there are certain fixed classes (genera and species), to which all things belong, and if knowledge is regarded as consisting in placing particular things in their proper classes, the class view is obviously the right one." (The Elements of Logic, p. 71).

(3) The Connotative or Attributive View.

According to this view, which is mainly supported by Mill the subject and the predicate are both taken in connotation. A proposition expresses that the attributes connoted by the predicate do or do not accompany the attributes connoted by the subject. The proposition 'Man is mortal,' means that the attribute of 'mortality' accompanies the attribute of 'humanity.' The proposition 'No man is perfect' implies that the attribute of 'perfection' does not accompany the attribute of 'humanity.'

This view is important from the point of view of scientific induction. From this point of view a proposition aims at establishing a connection between two attributes without a thorough examination of the corresponding classes.

But from the psychological point of view this theory is not correct. In most propositions the subject has primary reference to things and to interpret it connotatively is altogether unnatural. In the proposition 'Crows are black,' for instance the primary reference is not to *crow-ness* but to the crows themselves.

(4) The Connotative-denotative View. According to this view the subject is taken in connotation and the predicate in denotation. The proposition 'Man is mortal' is said to imply that 'humanity' is an attribute found in the class of 'mortal beings.' This interpretation is particularly useful in cases where the attribute indicates the presence of the object, as, for example, in the proposition, 'A liquid metal is mercury.' It helps to identify the objects by means of the attributes.

But it is not the common way of interpreting propositions and it can be defended neither psychologically nor logically.

In conclusion, it may be pointed out that none of these theories is adequate by itself. Each of them is useful for certain special purposes only.

There are two reasons for this :

1. They take the subject and the predicate either purely in extension or purely in intension. But this is unnatural because the thing and its attributes cannot be separated from each other.

2. They are not consistent with the true nature of a proposition which is a unity-in-difference. They emphasise only the aspect of unity or only the aspect of difference. For instance the denotative view emphasises purely the aspect of unity and the connotative view emphasise the aspect of difference. The predicative view would

have satisfactorily represented the nature of a proposition' as a unity-in-difference but it gives up its claim to this by its insistence on regarding the subject as purely in extension and the predicate purely in intension.

2. Do Propositions express a relation between words, ideas or things ?

This is a psychological question. But it has important bearing on the nature of predication. We shall, briefly discuss the different views that have been held on it.

(a) The Linguistic or Nominalistic View.

According to this view propositions are statements of relation between names. Hobbes is a representative of this school. He interprets a proposition as implying that the predicate is a name. Thus the propositions 'Horses are quadrupeds' means that 'quadruped' is a name of the same thing of which 'horse' is a name. Whately, taking his stand on this view regards logic as a science of mere verbal consistency.

This view is most inadequate. For names must refer to things or ideas. Taken by themselves they are only a meaningless jargon. This view has, therefore, to be combined with one of the other views according to which propositions refer to things or to ideas.

When, however, we regard names as having meanings or a reference to ideas the importance of this view must be recognised as insisting that we should be consistent in our use of words and that we should not use the same term in different meanings in the same reasoning.

(b) The Objective or Realist View. According to this view propositions express a relation between things which are really existing. For example, the meaning of the proposition 'Man is mortal' is that mortality co-exists with humanity. Mill is a staunch supporter of this view. All our propositions, according to him, are made with reference to reality and not with reference to names or ideas, and consequently he adopts a material treatment of logic throughout.

We agree with Mill that propositions refer to things. But we do not agree with his interpretation of 'things' as implying phenomena out of all relation to mind and its ideas. If things do not enter into relation with mind, how can they acquire any meaning and how can there be propositions? We cannot think of things without ideas which correspond to them. A proposition, therefore, cannot express a relation between things without referring to their ideas.

(c) **The Subjective or Conceptualist View.** According to this view, which is represented by Kant, Mansel and Thompson, a proposition expresses a relation of agreement or disagreement between two concepts or ideas. The proposition 'Man is mortal' means that there is compatibility or agreement between the ideas of 'humanity' and 'mortality.' The writers of this school, therefore, define logic as the 'the science of the pure or formal laws of thought,' or as 'the science of thought as thought,' which makes logic conversant with thoughts, independent of the things thought about.

This view is right in so far as it contends that propositions involve ideas and that without ideas there can be no propositions. But it is wrong in holding that ideas do not have a reference to things. An idea must be an idea of something. Hence propositions having reference to ideas must indirectly refer to things. Besides ideas to be clear and distinct must be expressed in language, and, therefore, propositions expressing a relation between ideas, must also refer to names or terms.

Thus none of these theories is satisfactory. But each has an important element of truth in it. What is needed is a theory based on an organic view of relation between thought, words and things. In his respect **Bradleys' theory** is much more satisfactory. According to him every judgment involves an idea or a universal meaning, but this meaning is referred in every case to an objective reality. Every proposition is made on certain grounds or in a certain universe of discourse, to which it refers. The universe of discourse may be that of physical reality, that of mythology, that of poetry, that of novel, etc.

EXERCISE X

1. What is meant by the import of Propositions? Explain the different views that are held on Import of Propositions. 'Which of these views appears to you to be most Satisfactory? Why?' (U.P.B. 1929)
2. What do you understand by the Theories of Predication? Explain and illustrate the different theories by reference to a concrete Example. (C.U. 1923).
3. State clearly the meaning of the expression 'The Import of Propositions' and state the principal views advanced by logicians regarding import. What precisely does the proposition 'All men are mortal' mean according to each of these views?

CHAPTER XI

INFERENCE

1. Nature of Inference.

Science aims at the discovery of facts. Some facts are discovered directly by perception, some are discovered indirectly with the help of those already known. For example, we go round the country and discover directly by means of observation that a good rice crop is growing. From this truth we may draw out a series of others without actual observation, e.g., 'There has been a good rain,' 'The farmers must be rejoicing,' and 'Rice in the coming season will be cheap.' When we thus explicate one truth from another we are said to *infer*. **Inference or Reasoning is the process of deriving one truth from others.** An Inference expressed in language is called an **Argument**. An argument consists of two or more propositions, containing the truths that are known and the truth that is derived from them. The propositions that are known are called **Premises** and the proposition that is derived is called the **Conclusion**.

The name *Inference* is sometimes used in a more restricted sense to imply only the result or *product* of reasoning. But strictly speaking an inference is the whole mental construction, including the conclusion as well as the premises.

Two important characteristics of inference may here be emphasised. *Firstly*, it tells us something *new*—something not directly expressed by the premises. Its conclusion

does not repeat in different words what we already know from the premises. But it enables us to pass from the known to the unknown. *Secondly*, the conclusion necessarily follows from the premises. There is a necessary bond of connection between the two which alone makes the inference possible. Between the propositions "Mangoes are sweet" and "Crows are black," for example, there is no necessary bond of connection and hence one cannot be inferred from the other; but between the propositions "All politicians are shrewd" and "Pandit Jawāhar Lal Nehru is a politician" taken together and the proposition "Pandit Jawahar Lal Nehru is shrewd" there is a necessary connection, which makes an inference, in this case possible.

It will be observed that the necessity by which the conclusion follows from the premises rests on *similarity*. From mere difference nothing can be inferred. In deductive inference we cannot infer about a particular object or group of objects what is known as true of the whole class of such objects unless we know that the former form a part of the latter i. e., unless we know that they are essentially similar to them. Similarly in Inductive Reasoning we proceed from the knowledge that something is true of a number of similar objects that we have observed to the knowledge that the same thing is true of all other members of the same class on the ground of essential similarity between them. Thus *similarity or resemblance is the real ground of all inference.*

2. Kinds of Inference.

Inference is either Deductive or Inductive. In **Deductive Inference** we usually proceed from a general truth to a particular or less general truth, e.g., *All material bodies expand by heat; mercury is a material body; therefore mercury expands by heat**. In **Inductive Inference** we

derive a more general truth from less general or particular truths e.g., *Air, water, iron*, etc. expand by heat ; therefore, *all* material bodies expand by heat. Deductive inferences aim at formal truth, while Inductive inferences aim at material truth (See Chap. III. Sec. 3).

Deductive Inference, again, is either Immediate or Mediate. It is **Immediate** if the conclusion follows from one premise, **Mediate** if the conclusion follows from more than one premise. Thus the inference

All men are mortal,

∴ Some mortal beings are men.

is immediate, while the inference

All men are mortal.

All kings are men.

∴ All kings are mortal.

is mediate.

Immediate Inference is also of two kinds : (1) *Immediate Inference by Opposition of Proposition* and (2) *Eduction*. In Immediate Inference by *Opposition of Propositions* a proposition is given to be true or false and we infer from it the truth or falsity of other propositions having the same subject and predicate but differing from it in quality or quantity or in both. In *Eduction* a given proposition is regarded as true and we derive other propositions implied by it. We

*The conclusion and the premises of a deductive inference are sometimes equally general, e.g.,

All rational animals can judge,

All men are rational animals ;

∴ All men can judge.

Deductive inferences of this kind are called *Traduction*.

look at the same truth from different points of view and express it in different verbal forms.

The next two chapters treat mainly of these two kinds of immediate inference.

3. Is Immediate Inference Real Inference ?

The question is often asked whether Immediate Inferences are real inferences at all. Mill has objected that in Immediate Inference "*there is in the conclusion no new truth, nothing but what was already asserted in the premises, and obvious to whoever apprehends them.*" Bain says that there is in it "*merely the transition from one wording to another wording of the same fact.*"

It is true that in Immediate Inference there is but a small step from the premise to the conclusion; it makes no substantial advance to a new truth. But it is wrong to say that it is a mere repetition of the premise in a different form. In it *the conclusion states explicitly what is implicitly present in the premise*, and in this sense it does involve an advance to a new truth. The conclusion is new though it is contained in the premise. It is new, because in the premise it is present only by implication. The premise does not state it clearly. We shall appreciate this better when we have considered the various kinds of Immediate Inference. We shall then realise fully how much is contained in a single proposition, which must be explicated before we can know it. It is unknown so long as it is not explicated. Immediate Inferences help us to explicate it and thus they involve a *passage from the unknown to the known*.

It must, however, be admitted that Immediate Inferences are principally of an interpretative character. Welton has, therefore, aptly styled them as *Interpretative Inferences*.

EXERCISE XI

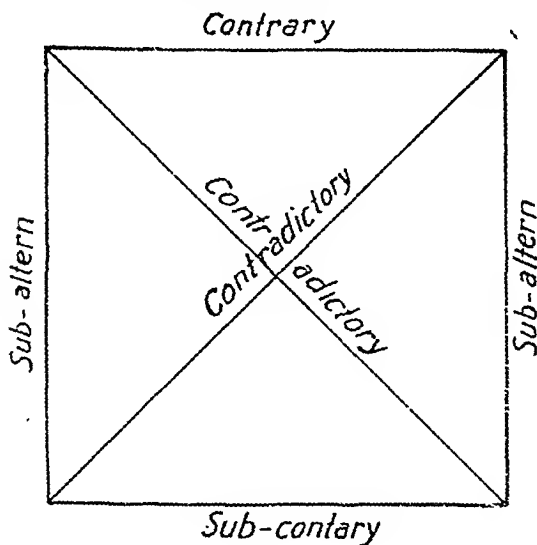
1. Distinguish between Immediate and Mediate Inference.
(C. U. 1928)
2. Distinguish between Immediate and Mediate Inference.
Can the former be properly called an Inference?
(C. U. 1924).
3. Classify inferences with examples. (C. U. 1920).

CHAPTER XII

IMMEDIATE INFERENCE BY OPPOSITION

1. Opposition.

Opposition is the relation between two propositions referring to the same matter but differing in form, i.e. having the same subject and predicate but differing in quality or quantity or in both. Given the same subject and predicate we can have only four propositions A, E, I, O. Opposition is, therefore, the mutual relation that may obtain between any two of these. The different kinds of relation between these may be represented by a diagram called the **Square of Opposition**.



Contrary Opposition is the relation between two universal propositions which differ in quality, and the propositions thus related to each other are called **Contraries**.

Sub-contrary Opposition is the relation between two particular propositions which differ in quality, and the propositions thus related to each other are called **Sub-contraries**.

Subaltern Opposition is the relation between two propositions which differ only in quantity, and the propositions thus related to each other are called **Sublterns**.*

Contradictory Opposition is the relation between two propositions which differ both in quality and quantity, and the propositions thus related to each other are called **Contradictories**.

Thus A and E are Contraries ; I and O are Sub-contraries, A and E, or E and O are Subalterns ; A and O, or E and I are Contradictories.

According to the ordinary meaning of the word 'Opposition' only those propositions can be said to be opposed to each other which cannot both be true together. In this sense opposition can exist only between the contradictories and the contraries, and not between the sub-alterns and the sub-contraries. But the word is here used in a technical sense to include any relation between propositions based on difference of quantity or quality, or both.

* The universal proposition is called *Subalternant* and the particular proposition is called *Subalternate*.

2. Immediate Inference by Opposition

In **Immediate Inference by Opposition** any one of the four propositions, A, E, I, O is given as true or false and we have to say what we can about the truth or falsity of the others in the same matter or bearing on the same point.

The following are the **Laws of Immediate Inference by Opposition** :

(1) **Subalterns may both be true and may both be false; both are true if the universal be true, both are false if the particular be false.** In other words *if the universal be true, the particular is also true, but if the particular be true the universal may or may not be true, i.e., it is doubtful; if the particular be false, the universal is also false, but if the universal be false the particular may or may not be, false, i.e. it is doubtful.*

Thus if the A proposition 'All men are mortal' be true, the corresponding I proposition 'Some men are mortal' is also true; but if the I proposition 'Some men are thieves' be true, the corresponding A proposition 'All men are thieves' may or may not be true. If the I proposition 'Some men are perfect' be false, the A proposition 'All men are perfect' is also false; but if the A proposition 'All businessmen are liars' be false, the I proposition 'Some businessmen are liars' is uncertain, i.e., it may or may not be false.

Similarly if the E. proposition 'No man is perfect' be true, the O proposition 'Some men are not perfect' is also true; but if the O proposition 'Some businessmen are liars' be true the A proposition 'All businessmen are liars' is uncertain. If the O proposition 'Some men are not mortal'

be false, the E proposition 'No man is mortal' is also false; but if the E proposition 'No business man is liar' be false, the O propositions 'Some men are not liars' is quite uncertain.

The law of Subaltern Opposition is an immediate application of the Law of Identity, because it follows from the very meaning of the universal and particular propositions. The truth of the universal proposition implies the truth of the particular proposition and the falsity of the particular proposition implies the falsity of the universal proposition because the universal would not be universal if it did not include, each and every particular.

Again the truth of the particular does not imply the truth of the universal, and the falsity of the universal does not imply the falsity of the particular, because the particular is always less than the universal.

(2) Contradictories cannot be both true or both false. *One must be true and the other must be false.* If one be true the other must be false, if one be false the other must be true. Thus :—

If A (All creatures feel pain) be true,
O (Some creatures do not feel pain) is false.

If A (All creatures feel pain) be false,
O (Some creatures do not feel pain) is true.

If O (Some creatures do not feel pain) be true,
A (All creatures feel pain) is false,

If O (Some creatures do not feel pain) be false,
A (All creatures feel pain) is true.

Similarly if E be true I is false, if E be false I is true, if I be true E is false, if I be false E is true.

The Law of Contradictory Opposition follows from the laws of contradiction and Excluded Middle. By the

Law of contradiction two contradictory propositions cannot be true together, i.e., one must be false. By the Law of Excluded Middle both cannot be false together, i.e., one must be true.

“Any pair of propositions” as Coffey points out “which cannot be true together, or false together, may rightly be called contradictories, even though they be not logically formulated according to the A, E, I, O, scheme, or even though they have not exactly the same terms as subject and predicate, e.g. ‘All virtuous people are happy’ and ‘some non-happy people are virtuous.’”

(3) Contraries may both be false but cannot both be true. *If one be true the other is false.* If the A proposition ‘All men are mortal’ be true the corresponding E proposition ‘No man is mortal’ is false; if the E proposition ‘No man is perfect’ be true, the corresponding A proposition ‘All men are perfect’ is false. *But if one be false the other may be false or may not be false, i.e., it is doubtful.* Thus the A proposition ‘All men are thieves’ is false and its corresponding E proposition ‘No man is thief’ is also false. But the A proposition ‘All men are perfect’ is false and its corresponding E proposition ‘No man is mortal’ is true.

The Law of Contrary Opposition may be derived from the Principle of Contradiction and the Law of Subalternation thus:— If A or E be true I or O must be true (by *subalternation*) and if I or O be true E or A must be false (by *contradiction*). Hence if A or E be true E or A must be false i.e. the *contraries cannot be true together*. Similarly if A or E be false O or I is true (by *contradiction*) but if O or I be true E or A is doubtful (by *subalternation*). Hence if A or E be false E or A is doubtful (which means that

E or A may also be false) i.e., *contraries may be false together*.

Thus contrary propositions are incompatible with regard to truth but not with regard to falsity ; hence contrary opposition is formally a less perfect form of opposition than contradictory opposition though materially the former expresses a greater degree of divergence than the latter.

(4) Sub-contraries may both be true, but cannot both be false. One of them must be true though it cannot be said that one of them must be false. If *one be false the other is true*. If the I proposition 'Some men are perfect' be false, the corresponding O proposition 'Some men are not perfect' is true ; if the O proposition 'Some men are not mortal' be false, the corresponding I proposition 'Some men are mortal' is true. If one be true the other may be false or may not be false i.e., it is *doubtful*. Thus the I proposition 'Some men are thieves' is true and the corresponding O proposition 'Some men are not thieves' is also true. But the I proposition 'Some men are mortal' is true and the corresponding O proposition 'Some men are not mortal' is false.

The Law of Sub-contrary Opposition may also be derived from the Principle of contradiction and the Law of Subalternation thus :— If I or O be false, A or E must be false (by *subalternation*), and if A or E is false O or I must be true (by *contradiction*). Hence if I or O be false, O or I must be true, i.e., *sub-contraries cannot both be false*. Again if I or O be true E or A must be false (by *contradiction*), and if E or A is false O or I is doubtful (by *subalternation*.) Hence if I or O be true O or I is doubtful, which means that O or I may also be true), i.e., *sub-contraries may both be true*.

The following table summarises all the inferences obtainable by Opposition :—

Given		A	E	I	O
1	A True	..	False	True	False
2	A False	..	Doubtful	Doubtful	True
3	E True	False	..	False	True
4	E False	Doubtful	..	True	Doubtful
5	I True	Doubtful	False	..	Doubtful
6	I False	False	True	..	True
7	O True	False	Doubtful	Doubtful	..
8	O False	True	False	True	..

It may be noted that contradictory opposition is the most perfect of all forms of opposition because contradictions, as we have seen, are opposed to each other both as regards their truth and as regards their falsity; the truth of one can be inferred from the falsity of the other and the falsity of one from the truth of the other. This is the only kind of logical opposition in which the relation is truly reciprocal and between the truth of one proposition and the falsity of other or between the falsity of one and the truth of other there is no middle course possible. Of two contradictory propositions one must be true and the other must be false; whereas of contrary propositions both may be false,

of sub-contraries both may be true and of subalterns both may be true and both may be false.

In controversy contradictory opposition has a distinct advantage over contrary opposition, because in the former when we have to disprove a universal proposition we assert *only the minimum* which is necessary to prove it false, while in the latter we go beyond the minimum and have place for a mean of truth, thus allowing the possibility of both the original and the new proposition being false together. Thus in order to contradict the proposition 'No business man is liar', it is safer to assert that 'Some (i.e. at least one) business men are liars' than to assert that 'All business men are liars.' Between the proposition 'No business man is liar' and 'Some business men are liars' there is no middle course possible, but between the propositions 'No business man is liar' and 'All business men are liars' there is a middle course possible, for some business men may be liars and some may not be liars.

3. Opposition in Singular propositions.

Singular propositions admit of only one kind of opposition, namely contradictory opposition. The contradictory of 'Tagore was the author of Gitanjali' is 'Tagore was not the author of Gitanjali.'

Some logicians suggest that the square of opposition may be completed in this case if we express the singular proposition in the form 'This S is always P.' We may then have

'This S is never P' as its contrary;

'This S is sometimes P' as its subaltern;

and 'This S is sometimes not P' as its contradictory.¹

But the propositions treated in this form are not singular in the strict sense of the term.

4. Exercises Worked Out.

Ex. 1. What are the inferences by the various kinds of opposition from the truth of the proposition 'All is not gold that glitters' (P. U. 1932).

¹ Stock, Logic p. 216.

Answer: Logical form of the proposition.= 'Some glittering things are not gold' O.

If 'Some glittering things are not gold' (O) is *true*,

(1) its *Contradictory* 'All glittering things are gold' is *false*, because contradictories *cannot* both be true.

(2) its *Sub-contrary* 'Some glittering things are gold' (I) is *doubtful*, because 'sub-contraries *may* both be true.

(3) its *Sub-altern* 'No glittering things are gold' (E) is *doubtful*, because sub-alterns *may* both be true if the particular is true.

(4) its *Contrary* is *not possible*, because particular propositions do not have this relation.

Ex. 2. If the proposition 'Some cats dislike flesh' is false what inferences can we draw by opposition?

(P. U. 1930).

Ans: Logical Form=Some cats are animals that dislike flesh. (I)

(1) *Contradictory*: 'No cats are animals that dislike flesh' is *true*, because contradictories cannot both be false.

(2) *Sub-Contrary*: "Some cats are not the animals that dislike flesh" is *true*, because sub-contraries cannot both be false.

(3) *Subaltern*: "All cats are the animals that dislike flesh" is false, because if the particular is false, the universal must be false.

EXERCISE XII

1. What is opposition? Is Subalternation a form of opposition? Draw the square of opposition to illustrate your answer. If O is false, what propositions are true or doubtful and why? (C. U. 1936).

2. What is meant by opposition of proposition? Draw the square of opposition to illustrate your meaning. Give the rules of Immediate Inference by contrary and subcontrary opposition. (C. U. 1931).

3. What do you understand by the Opposition of Propositions?

What inferences can you draw from the following :—

(a) 'That all the students will pass is false.'

(b) 'That some students are clever is true.' (P. U. 1925)

4. Reduce the following propositions to logical form and explain their mutual relations in respect of compatibility :—

(1) Honest men are never happy.

(2) Most unhappy men are dishonest.

(3) No one is happy unless he is honest. (U.P.B. 1932).

5. Express the statement 'Breathes there a man with soul so dead' in strict logical form, and assuming it to be true state the truth and falsity of its Contradictory, Subaltern and Contradictory proposition.

(U. P. B. 1934).

6. Prove by means of contradictory propositions that sub-contrary propositions cannot both be false. (C.U. 1929).

7. Show by means of subcontrary propositions that contrary propositions may both be false (or cannot both be true).

(C.U. 1931).

CHAPTER XIII

EDUCTIONS

1. **Eduction : Kinds of Eduction.**

Eduction is the process by which from a given proposition, accepted as true, we deduce others implied by it, though differing from it in subject or predicate or in both. Every categorical proposition has two terms the subject (S) and the predicate (P), but indirectly it suggests two other terms, i.e., the contradictory of the subject (not-S) and the contradictory of the predicate (not-P). The problem of Education is: if a proposition in which S and P are connected is given as true, how many legitimate predications may be made about S or not-S in terms of P or not-P, and how many of P or not-P in terms of S or not-S? Thus we get the following principle modes of inference :—

(1) *Obversion*—when in the inferred proposition the subject is S and the predicate *not-P*.

(2) *Conversion*—when in the inferred proposition the subject is P and the predicate S (or *not-S*).

(3) *Contraposition*—when in the inferred proposition the subject is *not-P* and the predicate S (or *not-S*).

(4) *Inversion*—when in the inferred proposition the subject is *not-S*, and the predicate P or *not-P*.

2. **Obversion.**

Obversion may be defined as a process of immediate inference by which from a given proposition we deduce another having for its subject the

former subject and for its predicate the contradictory of the former predicate. The given proposition is called the *obvertend*, the inferred proposition the *obverse*.

This kind of immediate inference, it may be noted, is not real inference. In obverting a proposition we do not make a *distinct advance in thought*. The second proposition does not express a *new* truth. It expresses the same truth in a different form. To obvert is to express negatively what was expressed positively or vice versa. It is changing an affirmative proposition into negative or a negative proposition into affirmative in such a manner that its meaning does not change. Obversion is, however, useful as a step in other forms of immediate inference.

The following are the Rules of Obversion :—

- (1) The subject of the proposition remains the same but the *predicate is negated*.
- (2) The quantity of the proposition remains the same but *the quality is changed*.

The change in the quality of the proposition is neutralised by the change in the quality of the predicate and thus the meaning of the original proposition remains unaltered.

Let us now apply these rules to the four forms of categorical propositions.

(i) Obversion of A

In the obversion of 'All S is P' the subject remains 'S', the predicate is changed into 'not-P'; the quantity remains universal while the quality is changed into negative. Thus we get 'No S is not-P'. Hence 'All S is P' (All

men are mortal) obverts to 'No S is not-P' (No men are non-mortal), i.e., **A** obverts to **E**.

(ii) Obversion of **E**.

In the obversion of 'No S is P', the subject remains 'S,' the predicate is changed into 'not-P,' Quantity remains universal while the quality is changed into affirmative. Thus we get 'All S is not-P,' Hence 'No S is P' (No men are perfect) obverts to 'All S is not-P' (All men are non-perfect) i.e., **E** obverts to **A**.

(iii) Obversion of **I**.

In the obversion of 'Some S is P,' the subject remains 'S,' the predicate is changed into 'not-P,' the quantity remains particular while the quality is changed into negative. Thus we get 'Some S is not not-P'. Hence 'Some S is P' (Some men are virtuous) obverts to 'Some S is not non-P' (Some men are not non-virtuous) i.e., **I** obverts to **O**.

(iv) Obversion of **O**.

In the obversion of 'Some S is not P,' the subject remains 'S,' the predicate is changed into 'non-P,' the quantity remains particular while the quality is changed into affirmative. Thus we get 'Some S is non-P.' Hence 'Some S is not-P' (Some men are not virtuous) obverts to 'Some S is non-P' (Some men are non-virtuous), i.e., **O** Obverts to **I**.

The obversion of an affirmative proposition is based on the Principle of Contradiction, because it lays down that two contradictory terms cannot both be true at the same time, so that if anything is affirmed of a subject its contra-

contradictory must at the same time be denied of it. The obversion of a negative proposition is based on the Principle of Excluded Middle, because the principle lays down that two contradictory terms cannot both be false at the same time so that if any thing is denied of a subject its contradictory must at the same time be affirmed of it.

Obversion has been called by different names: *Permutation*, *Aequipollence*, *Contraversion*, *Immediate Inference by Privative Conception*.

Bain distinguishes formal obversion from what he calls *Material Obversion*, i.e., a form of obverse inference 'justified only on an examination of the matter of the proposition'. As examples of the latter he mentions: "Warmth is agreeable, therefore cold is disagreeable." "Knowledge is good, therefore, ignorance is bad." These inferences, however, resemble *inversion* more than *obversion*, and since they are guaranteed only by an independent examination of the facts they do not deserve to be called inferences in the proper sense of the term.¹

3. Conversion.

Conversion is a form of immediate inference by which from a given proposition we deduce another having for its subject the former predicate and for its predicate the former subject. The given proposition is called the *convertend*, the inferred proposition the *converse*.

The following are the **Rules of Conversion** :—

- (1) *The quantity of the proposition remains the same.*
- (2) *No term is distributed in the converse which is not distributed in the convertend.*

The quality of the proposition must not change because the converse makes the same assertion as the convertend though from a different standpoint. As regards the quantity

¹ Coffey, *Ot. Ct.*, p. 232

it is clear that the converse cannot assert more than what is given in the convertend. This implies that no term can be distributed in the converse which is not distributed in the convertend. We cannot pass from 'All Jugglers are men' to 'All men are jugglers' because 'men' being the predicate of the convertend, which is an affirmative proposition, is not distributed in it. The rule of distribution of terms, therefore, sometimes makes a reduction in the quantity of the proposition necessary. The form of conversion in which the quantity of the converse is the same as that of the convertend is known as Simple Conversion, while the form in which the quantity of the convertend is reduced is known as Conversion by Limitation or **Conversion per Accidens**.

Let us apply the above rules to the four forms of categorical propositions.

Conversion of A.

In the conversion of 'All S is P' 'S' and 'P' change places. 'P' being undistributed in the convertend remains undistributed in the converse and the quality of the proposition remains the same i.e., affirmative. Thus 'All S is P' (All men are mortal) converts to some 'P is S' (Some mortals are men) and not to 'All P is S,' because in that case P gets distributed. In other words **A converts to I**.

Since the quantity of an A proposition is necessarily reduced by conversion we say that it is converted *per accidens*. We may, however note that *simple conversion* of an A proposition is possible where the subject and the predicate have the *same denotation*, i.e., in the case of (1) *Definitions*, e.g., 'All triangles are plain figures bound-

ed by three straightlines' which may convert to 'All plain figures bounded by three straight lines are triangles,' (2) *Tautologous propositions*, e.g., 'All men are human beings' which may convert to 'All human beings are men' and (3) *Propositions of which the subject and the predicate are both definite singular terms* e.g., 'Mr. Atlee is the present prime minister of England' which converts to 'The present prime minister of England is Mr. Atlee.'

Conversion of E.

In the conversion of 'No S is P' 'S' and 'P' change places and since both are distributed in the convertend they remain distributed in the converse; the quality of the proposition remains the same, that is, negative. Thus 'No S is P' (No men are perfect) converts to 'No P is S' (No perfect beings are men). In other words **E converts to E.**

Conversion of I.

In the conversion of 'Some S is P' 'S' and 'P' change places and since both are undistributed in the convertend both remain undistributed in the converse; the quality remains the same, i.e., affirmative. Thus 'Some S is P' (Some men are intelligent) converts to 'Some P is S' (Some intelligent beings are men). In other words **I converts to I.**

Conversion of O.

In the conversion of 'Some S is not P' 'S' and 'P' change places i.e., 'S' becomes the predicate of the converse and P becomes the subject, 'S' which is undistributed in the convertend must remain undistributed in the converse. But, the convertend being negative the converse must be negative and it must distribute its predicate. It follows, therefore, that an **O proposition cannot be converted.**

The process of conversion is based on the Principle of Identity, and is as self-evident as the latter. If S and P are identical or co-extensive, it makes no difference whether we say 'S is P' or 'P is S' *to the same extent to which they are co-extensive*; or, if S and P are not identical or co-extensive, it makes no difference whether we say 'S is not P' or 'P is not S' *to the same extent to which they are not co-extensive*. The process of conversion presupposes that in passing from one proposition to the other we are looking at *one and the same reality* from two different standpoints.

The very simplicity of the process leads Bain and some other logicians to believe that conversion is not a form of inference. It is maintained that the converse simply formulates the truth expressed in the convertend in different terms and does not tell us any thing new. But the fact is that the converse instead of expressing the same truth in *different terms* approaches the same truth from a *different standpoint* and in as much as it does this it informs us of something *new*. If conversion implied no more than a verbal change errors in converting propositions would not be so common. Even great thinkers sometimes convert propositions wrongly. The commonest fallacy is the simple conversion of an A proposition. Thus it is wrongly inferred that because very intelligent persons have large brains, all who have large brains are very intelligent. Because congress men wear khadder, it is concluded that all who wear khadder are congressmen.

In conversion of any proposition it is necessary that the *whole* subject changes places with the *whole* predicate. For example the converse of 'All married men have been

bachelors' is not 'Some bachelors have been married men,' but 'Some who have been bachelors are married men.' 'Churchill succeeded Chamberlain' does not convert to 'Chamberlain succeeded Churchill' but to 'Some person who succeeded Chamberlain is Churchill.' Such mistakes in conversion may be easily avoided if care is taken to reduce a proposition into the strict logical form before it is converted.

Inference by Converse Relation.

When the connection between the subject and the predicate of a proposition is expressed by means of a relative term we may convert the proposition by transposing the subject and the predicate and replacing the relative term by its correlative. Thus we may pass from 'Humayun was the son of Babar' to 'Babar was the father of Humayun,' from 'February follows January' to 'January precedes February,' from 'A is greater than B' to 'B is less than A.' This kind of inference is known as *Inference by Converse Relation*.

Obverted Conversion.

If we obvert the converse of any proposition we get a new inference from the original proposition by a new mode of immediate inference which may be called Obverted Conversion. For example "All S is P" may be converted to "Some P is S", which may be obverted to "Some P is not non-S." "Some P is not non-S" is, thus, the obverted converse of "All S is P." This is a compound form of immediate inference involving both conversion and obversion. *The subject of the obverted converse is the original predicate and its predicate is the contradictory of the original subject.*

4. Contraposition.

Contraposition is a form of immediate inference by which from a given proposition we derive

another having for its subject the contradictory of the original predicate. The proposition thus derived is called the *Contrapositive*.

We have seen that the contradictory of the predicate of a proposition appears as the predicate of the obverse of that proposition. If, then, we convert the obverse of the given proposition we shall easily obtain another proposition with the contradictory of the original predicate as its subject. Thus, given a proposition 'S is P,' if it is required to infer from it another proposition with 'non-P' as subject, we may do so by obverting the proposition into 'S is not non-P' and then converting this obverse into 'Non-P is not S.' Therefore the simple rule of contraposition is :—

First obvert and then convert.

Contraposition is thus another form of compound immediate inference involving both obversion and conversion. It may also be called the *converted Obverse*. But the *Converted Obverse*, it should be noted, is quite different from the *Obverted Converse*, in which we first obvert and then convert and which, therefore, yields a different result.

Contraposition is also sometimes called *Conversion by Negation*, since it seeks to convert a proposition by substituting its negative. But it is not proper to call it conversion because the contrapositive has not the same subject as the converse and is also different from it in quality.

Contraposition of A.

'All S is P' (All men are mortal) obverts to 'No S is non-P' (No men are non-mortal), which converts to 'No

non-P is S' (No non-mortal beings are men). Therefore the contrapositive of 'All S is P' (All men are mortal is) 'No non-P is S' (No non-mortal beings are men), i.e., the **contrapositive of A is E**.

Contraposition of E.

'No S is P' (No man are perfect) obverts to 'All S is non-P' (All men are non-perfect) which converts to 'Some non-P is S' (Some non-perfect beings are men). Therefore the contrapositive of 'No S is P' (No men are perfect) is 'Some non-P is S' (Some non-perfect beings are men) i.e., the **contrapositive of E is I**.

Contraposition of I.

'Some S is P' obverts to 'Some S is not non-P' which being an O proposition cannot be converted. Therefore an **I proposition cannot be contraposed**.

Contraposition of O.

"Some S is not P' (Some Rajputs are not brave) obverts to 'Some S is non-P' (Some Rajputs are non-brave) which converts to 'Some non-P is S' (Some non-brave persons are Rajputs). Therefore the contrapositive of 'Some S is not P' (Some Rajputs are not brave) is 'Some non-P is S' (Some non-brave persons are Rajputs) i.e., the **contrapositive of O is I**.

It will be noted that in contraposition *the quality of the given proposition is changed and the quantity remains the same except in the case of E, in which it is reduced*.

Obverted Contraposition or Full Contraposition.

The contrapositive of any proposition may be obverted and a new inference from the original proposition may thus

be obtained by a new mode of immediate inference which may be called *Obverted contraposition*. Thus 'All S is P' may be contraposed to "No non-P is S" which may be obverted to "All non-P is non-S." "All non-P is non-S" is the obverted contrapositive of "All S is P." *The subject of the obverted contrapositive is the contradictory of the original predicate, its predicate is the contradictory of the original subject and its quality the same as that of the original proposition.* Obverted Contraposition is also sometimes called *Full Contraposition*.

5. Inversion.

Inversion is a process of immediate inference by which from a given proposition we derive another having for its subject the contradictory of the original subject. The given proposition is called the *Invertend*, the proposition that is inferred is called the *Inverse*.

Inversion, like contraposition, is a compound form of immediate inference. It has two forms: (a) *Partial Inversion*, in which the predicate of the inverse is the same as that of the invertend and (b) *Full or Complete Inversion*, in which the predicate of the inverse is the contradictory of the original predicate.

In contraposition, we have seen, the problem is to infer from a given proposition another with its *subject as the contradictory of the original predicate*. In Inversion the problem is to infer from a given proposition another with its *subject as the contradictory of the original subject*. Thus in inversion we do with the subject exactly what in contraposition we do with the predicate. To invert a proposition, therefore, all that we are required to do is to transfer the subject to the place of the predicate by conversion and

Contrapose the converse

Let us apply this process to the four forms of categorical propositions and see what results we obtain.

Inversion of E.

It will be convenient first to take the E proposition because the process is directly applicable to it:

- (1) No S is P (E)—Original Proposition.
- (2) No P is S (E)—Converse of (1)
- (3) All P is non-S (A)—Obverse of (2)
- (4) Some non-S is P (I)—Converse of (3)
= Contrapositive of (2)
= Inverse (Partial) of (1)

This may be further obverted to 'Some non-S is not non-P (O) to give the Complete Inverse of (1). Thus the **Partial Inverse of E is I**; the **Complete Inverse of E is O**.

Inversion of A.

The converse of A is I, which cannot be contraposed. Hence the above process cannot be directly applied to A. But we have the option of applying it to the A proposition indirectly by first obverting it to E in the following manner :

- (1) All S is P (A)—Original Proposition
- (2) No S is non-P (E)—Obverse of (1).
- (3) No non-P is S (E)—Converse of (2).
= Contrapositive of (1)
- (4) All non-P is non-S (A)—Obverse of (3)
- (5) Some non-S is non-P (I)—Converse of (4).
= Contrapositive of (3)
= Inverse (Complete) of (1).

We may further obvert (5) to 'Some non-S is not P, (I) to get the Partial Inverse of (1).

Thus to invert an A proposition we first obvert then convert and then contrapose, or, in other words, we *contrapose the contrapositive of the original proposition*. The **Partial Inverse of A is O**; the **complete Inverse of A is I**.

Inversion of I.

Converse of I is I which cannot be contraposed. Therefore I can not be inverted directly. We cannot also invert it by obverting it to O, because O cannot be converted. Hence **inversion of I is not possible**.

Inversion of O.

O cannot be inverted directly because it has no converse. It cannot be inverted indirectly because its obverse is I, which cannot be contraposed. Hence **inversion of O is not possible**.

To sum up : O and I cannot be inverted. The rule for inversion of A and E is :—

Contrapose the Contrapositive of A and the Converse of E.

The application of this rule directly gives Complete Inverse in the case of A and Partial Inverse in the case of E, which are further obverted to give the Partial Inverse of the former and Complete Inverse of the latter.

The following table summarises the results obtained by the different forms of Eduction with reference to

- (a) Subject and Predicate of the inferred propositions,
and

(b) Quality and quantity of the inferred propositions.

	Given Proposition	(a)	(b)			
		S—P	A	E	I	O
(1)	Obverse	S— \bar{P}	E	A	O	I
(2)	{ Converse	{ P—S	{ I	E	I	None
(3)	{ Obverted Converse	{ P— \bar{S}	{ O	A	O	None
(4)	{ Contrapositive	{ \bar{P} —S	E	I	None	I
(5)	{ Obverted or Full Contrapositive.	{ \bar{P} — \bar{S}	A	O	None	O
(6)	{ Partial Inverse	{ \bar{S} —P	O	I	None	None
(7)	{ Complete Inverse	{ \bar{S} — \bar{P}	I	O	None	None

Note :— \bar{S} and \bar{P} indicate non-S and non-P respectively.

6. Eductions of Hypothetical Proposition.

The simplest method of drawing eductions from hypothetical propositions is to change them into categorical propositions and then again to convert the conclusions drawn from them into the hypothetical form. For example, the proposition "If A is B, C is D" may be contraposed thus.

(i) A. In all cases if A is B, C is D . . . *Hypothetical.*

(ii) A. All cases of A being B are cases of C being D *Categorical form of (i).*

(iii) E. No case of A being B is a case of C not being D *Obverse of (i').*

(iv) **E.** No case of C not being D is a case of A being B
 *Converse* of (iii) or, *Contrapositive* of (ii).

(v) **E.** In all cases if C is not D, A is not B.
Hypothetical form of (iv), or *contrapositive* of (i).

Eductions of Disjunctive Propositions.

Eductions may be drawn from disjunctive propositions in which alternative predicates are affirmed of one subject, thus :—

Orig. Prop. Every S is either P or Q.

Obverse. No S is both non-P and non-Q.

Converse. Somethings that are either P or Q are S.

Contrapositive. Nothing that is both non-P and non-Q is S.

Inverse. Some non-S is neither P nor Q.

It will be noted that the derived propositions are not disjunctive, and in as much as this is so, real eduction from disjunctive proposition is not possible.

8. Less Important Eductions.

We have discussed the chief forms of eduction, There are some less important forms of it, which we may now consider.

(i) Transversion or Change of Relation.

Transversion or Change of Relation is the process by which from a proposition of one relation we infer a proposition of different relation. Transversion has four distinct forms, for we may infer (1) A hypothetical from a Categorical, (2) a Categorical from a Hypothetical, (3) Hypotheticals from a Disjunctive, or (4) a Disjunctive from Hypotheticals.

In inferring a hypothetical from a categorical or a Categorical from a hypothetical we should remember that.

(a) The antecedent and the consequent of a hypothetical proposition correspond to the subject and the predicate of a categorical.

(b) The quantity of a hypothetical proposition is determined by its antecedent and the quality by its consequent.

1. *From a Categorical to a Hypothetical:*

- | | |
|-------------------------|--|
| A. All S is P | = In all cases if S is, P is. |
| All Gods are immortal | = In all cases if gods are (exist), immortality is (exists). |
| E. No S is P | = In all cases if S is, P is not. |
| No man is perfect | = In all cases if man is, perfection is not. |
| I. Some S is P | = In some cases if S is, P is. |
| Some men are honest | = In some cases if men are, honesty is. |
| O. Some S is not P | = In some cases if S is, P is not. |
| Some men are not honest | = In some cases if men are, honesty is not. |

2. *From a Hypothetical to a Categorical.*

- | | |
|-------------------------------------|---|
| A. If (in all cases) A is B, | |
| C is D | = All cases of A being B are cases of C being D. |
| If it rains, the ground will be wet | = All cases of raining are cases of ground being wet. |

E. If A is B, C is not D = No case of A being B is a case of C being D.

If it rains birds will
not fly about = No case of raining is a case
of birds flying about.

I. In some cases if A is B,
C is D = Some cases of A being B
are cases of C being D.

In some cases, if it rains the
farmers are happy = Some cases of raining
are cases of farmers
being happy.

O. In some cases if A is B,
C is not D = Some cases of A being B
are not cases of C
being D.

In some cases if it rains,
the farmers are not
happy = Some cases of raining
are not the cases
of farmers being happy.

3. *From a Disjunctive to Hypotheticals.*

There are two distinct views on the nature of a disjunctive proposition. Uberweg holds that the alternatives of a truly disjunctive proposition are mutually exclusive, i.e., the falsity of one implies the truth of the other *and vice versa*. But Mill and Jevons hold that the alternatives are not mutually exclusive, i.e., the falsity of one implies the truth of the other, *but not vice versa*. According to Uberweg

the alternatives are *like two contradictory propositions* but according to Mill and Jevons they are *like two sub-contrary propositions*. If Uberweg's view be correct the disjunctive proposition, 'A is either B or C' may be analysed into four hypothetical propositions :

- (1) If A is not C, A is B ;
- (2) If A is not B, A is C ;
- (3) If A is C, A is not B ;
- (4) If A is B, A is not C.

But if the view of Mill and Jevons be correct the disjunctive proposition 'A is either B or C' may be analysed into only two hypotheticals :

- (1) If A is not C, A is B ;
- (2) If A is not B, A is C.

Now, there is no doubt that the alternatives of a disjunctive proposition are sometimes mutually exclusive, but they are not usually so. **When the alternatives are mutually exclusive we can infer four hypotheticals from it i. e. we can infer the truth of the one from the falsity of the other and conversely.** For example, from the proposition 'He is either dead or alive' we may infer :

- (1) If he is not dead, he is alive;
- (2) If he is not alive, he is dead ;
- (3) If he is dead, he is not alive ;
- (4) If he is alive, he is not dead.

When the alternatives are not mutually exclusive we can infer only two hypotheticals, i. e., we can infer the truth of the one from the falsity of the other, but not conversely. For example, from

the proposition 'He is either a good student or a good sportsman,' we can infer :

- (1) If he is not a good student, he is a good sportsman.
- (2) If he is not a good sportsman, he is a good student.

But from the same proposition we cannot infer

- (3) If he is a good student, he is not a good sportsman ;
- (4) If he is a good sportsman, he is not a good student.

4. From Hypotheticals to Disjunctive.

From the process we have just discussed it follows that according to Uberweg we can infer a disjunctive proposition from no less than four hypotheticals, while according to Mill we can infer a disjunctive from two or more hypotheticals.

The question, is whether we can infer a disjunctive proposition from a single hypothegtical. This is possible in Mill's sense of a disjunctive proposition. From the hypothetical proposition 'If A is B, C is D' we may infer 'Either C is D or A is not B.' The passage from the one to the other is clear. The proposition 'If A is B, C is D' means that if 'A is B' is true the consequent 'C is D' must be true. If 'C is D' is not true it implies that 'A is B' also is not true or, in other words 'A is not B' is true. But there are only two alternatives : either 'C is D' is true or 'C is D' is not true. Since the falsity of 'C is D' implies the truth of 'A is not B' we may express the two alternatives by means of a single disjunctive 'Either C is D or A is not B.'

(ii) Modal Consequence.

Modal consequence is a form of immediate inference in which from a given proposition we infer another which differs from the first in modality. This kind of inference is some what similar to subaltern inference. It is governed by the following rules :

Rule 1. The truth of a proposition of greater certainty implies the truth of a proposition of less certainty; but not conversely.

The truth of a necessary proposition implies the truth of the corresponding assertory and problematic propositions, and the truth of an assertory proposition implies the truth of the corresponding problematic proposition. But the truth of a problematic proposition does not imply the truth of the corresponding assertory and necessary propositions, nor does the truth of an assertory proposition imply the truth of the corresponding necessary proposition.

Thus if 'S must be P' be true, then 'S is P' and 'S may be P' are also true, but if 'S may be P' be true, then 'S is P' is doubtful, and if 'S is P' is true then 'S must be P' is doubtful.

As material examples we may give :—

(a) (1.) The three angles of a triangle *must* together be equal to two right angles—*True*.

∴ The three angles of a triangle are together equal to two right angles—*True*.

∴ The three angles of a triangle *may* together be equal to two right angles—*True*.

(b) The world *is* round—*True*.

∴ The world *may be* round—*True*.

(c) 1. Mars *may be* inhabited by animals—*True*.

∴ Mars *is* inhabited by animals—*Doubtful*.

∴ Mars *must be* inhabited by animals—*Doubtful*.

2. He *is* rich—*True*.

∴ He *must be* rich—*Doubtful*.

Rule 2. *The falsity of a proposition of less certainty implies the falsity of a proposition of greater certainty; but not conversely.*

The falsity of a problematic proposition implies the falsity of the corresponding assertory and the corresponding necessary propositions. The falsity of an assertory proposition implies the falsity of the corresponding necessary proposition. But the falsity of a necessary proposition does not imply the falsity of the corresponding assertory and problematic propositions, nor does the falsity of an assertory proposition imply the falsity of the corresponding problematic proposition.

Thus, if 'S may be P' is false then 'S is P' and 'S must be P' are also false; but if 'S must be P' is false, then 'S is P' is doubtful, or if 'S is P' is false then 'S may be P' is doubtful.

As material examples we may give:—

(a) 1. Mars *may be* inhabited by animals—*False*.

∴ Mars *is* inhabited by animals—*False*.

∴ Mars *must be* inhabited by animals—*False*.

2. The sun *is* dark—*False*.

∴ The sun *must be* dark—*False*.

- (b) 1. Mars *must be* inhabited by animals—*False*.
 \therefore Mars *is* inhabited by animals—*Doubtful*.
 Mars *may be* inhabited by animals—*Doubtful*.
2. Mars *is* inhabited by animals—*False*.
 \therefore Mars *may be* inhabited by animals—*Doubtful*.

(iii) Inference by Added Determinants.

Immediate Inference by Added Determinants is the process by which from a given proposition we infer another by adding the same determinant or a qualification both to the subject and the predicate of the original; e.g.

A horse is an animal.

\therefore A *white* horse is a *white* animal.

This kind of inference is very simple. But sometimes it is very deceptive. From the proposition, 'A horse is an animal' most of us are likely to infer that 'A slow horse is a slow animal,' which is by no means correct; for even a slow horse is swift when compared with most animals. All that we can correctly infer from the proposition is that 'A slow horse is an animal which is slow for a horse.' Similarly, from the proposition 'An earth worm is an animal' we cannot infer that 'A swift earth worm is a swift animal,' but only that 'A swift earth worm is an animal swift for earthworm.' The essential thing to note is that *the determinant must qualify or affect the meaning of the subject and the predicate in an identical manner*. This purpose is not served by using the same word, unless it has the same force both in relation to the subject and the predicate, or unless it affects the meaning of both to the same extent or in the same manner. From the proposition 'A

lecturer is a man' we may infer that 'A tall lecturer is a tall man,' because the determinant 'tall' affects the meaning of the subject and the predicate in precisely the same manner, but from the same proposition we cannot infer that 'A bad lecturer is a bad man,' because the determinant here does not qualify the subject and the predicate in the same sense. 'Bad' means one thing (inefficient) in relation to 'lecturer,' but it means a different thing (immoral) in relation to 'man.'

(iv) Inference by Complex Conception.

Immediate Inference by Complex Conception is the process by which from a given proposition we infer another in which the original subject and predicate are used as parts of a more complex conception, e.g.

(1) A horse is an animal.

∴ The head of a horse is the head of an animal.

(2) Early marriage is an evil.

∴ The supporter of early marriage is the supporter of an evil.

(3) Poverty is a temptation to crime.

The removal of poverty is the removal of a temptation to crime.

This kind of immediate inference is similar to Inference by Added Determinants. There is just one important difference. In Added Determinants the original subject and predicate are both qualified by the same determinant. In complex conception the subject and the predicate themselves determine or qualify the additional element. In the above examples it is the words 'head' 'supporter'

and 'removal,' which are respectively determined or qualified by the original subject and predicate.

Here also we have to observe the same caution as in the case of Added Determinants. *The subject and predicate must limit the meaning of an additional term to the same extent and in the same manner*; otherwise the inference would be fallacious. Thus, from the proposition 'Bengalees are Indians' we cannot pass on to the proposition 'A majority of Bengalees is a majority of Indians'; nor from 'A sheep is not a dog' to 'The owner of a sheep is not the owner of a dog.'

9. Exercises Worked Out.

1. Show what conclusions, if any, can be drawn from each of the following propositions according to Conversion, Obversion, Contraposition and Inversion:

(i) All mathematicians are not philosophers.

(ii) None but the industrious deserve success.

Answer:—(i) *Logical Form*: Some mathematicians *are* not philosophers (O).

(a) It cannot be converted.

(b) Obverse. Some mathematicians *are* non-philosophers. (I).

(c) Contrapositive. Some non-philosophers *are* mathematicians.

(d) It cannot be inverted. (I).

(ii) *Logical Form*: All persons who deserve success *are* industrious. (A).

(a) Converse: Some industrious persons *are* those who deserve success. (I).

(b) Obverse: No persons who deserve success *are* non-industrious. (E).

(c) Contrapositive: No non-industrious persons *are* persons who deserve success. (E).

(d) Inverse:

Complete. Some non-deserving persons *are* non-industrious. (I.)

Partial. Some non-deserving persons *are not* industrious. (O).

2. Infer as many propositions as you can form the premiss, 'Every phenomenon has a cause.'

Answer—Logical Form : All phenomena are caused (A)

(1) No phenomenon is not-caused—Obverse.

(2) Somethings caused are phenomena—Converse.

(3) Some things caused are not non-phenomena—Obv. Converse.

(4) No not-caused things are phenomena—Contrapositive.

(5) All not-caused things are non-phenomena—Obv. Contrapositive.

(6) Some non-phenomena are not caused—Inverse (partial).

(7) Some non-phenomena are not-caused—Inverse (complete).

(8) Some phenomena are caused—Subalternation.

(9) Some phenomena are not caused—Contradiction (False).

(10) No phenomenon is caused—Contrariety (False).

(11) In all cases if phenomenon is cause is—Change of Relation.

(12) All phenomena may be caused—Modal Consequence.

(13) All phenomena must be caused. Do. (Doubtful).

3. Test the following arguments:—

(a) If the good people are happy, unhappiness is an indication of vice.

(b) No Brahmins are non-vegetarians.

∴ There are some other men who are non-vegetarians.

(c) All philosophers are not impractical men.

∴ Some impractical men are not philosophers.

(d) Most Indians are religious.

∴ Some non-Indians are not religious.

Answer.—(a) The logical form of the argument is :—

All good persons are happy—A.

∴ All unhappy persons are vicious—A.

The conclusion, here, is wrong Obverted Contrapositive of the premise. The correct Obverted Contrapositive would be

All not-happy persons are not-good—A.

‘Unhappy’ has been confused with ‘not-happy’ and ‘vicious’ has been confused with ‘not-good.’ ‘Unhappy’ and ‘vicious’ are the contraries of ‘happy’ and ‘good’ respectively, while their contradictories are ‘not-happy’ and ‘not-good.’

(b) Logical Form :—

No Brahmins are non-vegetarians.—E.

∴ Some Non-Brahmins are non-vegetarians—I.

This is a case of Partial Inversion, since the subject of the conclusion is the contradictory of the original subject and the predicate of the conclusion is the same as the original predicate. It is a valid argument because the partial inverse of E is I.

(c) Logical Form :—

Some philosophers are not impractical man—O.

∴ Some unpractical men are not philosophers—O.

This is Conversion. It is fallacious, because an O proposition cannot be converted.

(d) Logical Form :—

Some Indians are religious.

∴ Some non-Indians are not religious.

This is fallacious Inversion, because an I proposition cannot be inverted.

EXERCISES

1. What is meant by Immediate Inference? Can it properly be regarded as an inference? Classify and define the various kinds of Immediate Inference.

2. Can you draw a conclusion from a single premise? Name and explain the nature of the process by which this can be done. Draw all the conclusions you can from—All organic substances contain carbon. (U. P. B.)

3. Give concrete examples of an Exclusive and an Exceptive proposition; turn them into strict logical form, giving the inverse of the former and the converse of the latter.

4. Reduce the following propositions into the logical form and draw from each as many immediate inferences as possible by conversion, obversion and contraposition:

(a) Only material bodies gravitate.

(b) All upright men are not indifferent to flattery.

(c) Any one but an idiot will doubt it.

(d) No one can hope for success without industry. P. U. 1923

5. Define Conversion and Contraposition, illustrating each by giving the converse and contrapositive of 'Indians will not get Swaraj, if they are not united.' (U. P. B. 1933).

6. Express the following statements in strict logical form:

(a) Any student cannot pass the Intermediate Examination.

(b) Nearly everybody passed in this paper.

(c) Uneasy lies the head that wears a crown.

(d) Shall we submit to such a tyranny as this?

Give the contraposition of (a), obverse of (b), inverse of (c) and obverted converse of (d). (U. P. B. 1935).

7. Give the converse of the obverse and the obverse of the converse of the following propositions:—

(a) French men are talkative.

(b) None but dead languages are worth studying.

(c) All metals are not precious.

(d) All just acts are expedient.

8. Explain the relation between the following pairs of propositions:—

- (a) Only the ignorant despise knowledge.
Some persons despising knowledge are ignorant.
- (b) Good men are wise.
Good men are not unwise.
- (c) Some unwise men are good.
Some good men are unwise.
- (d) All good acts are expedient.
No bad acts are inexpedient.

9. Show by what kind of immediate inference each of the following propositions follows from "All discontented men are unhappy."

- (1) All happy men are contented.
- (2) Some discontented men are unhappy.
- (3) Some contented men are happy.
- (4) Some unhappy men are not contented.
- (5) No discontented men are happy.
- (6) Some happy men are contented.
- (7) Some contented men are not happy.
- (8) Some unhappy men are discontented.
- (9) No happy men are discontented.
- (10) Some discontented men are not happy.
- (11) Some happy men are not discontented.
- (12) None but unhappy men are discontented.

10. Examine the validity of the following immediate inferences:—

- (a) Undeclared men take wrong decisions.
∴ No right decisions are taken by the undeclared.
- (b) No one is admitted without payment.
∴ All who are admitted are persons who paid.
- (c) Honesty is the best policy.
∴ Dishonesty is the worst policy.

- (d) Only children behave in this way ;
∴ Every man who behaves thus is a child.
- (e) All mangoes are not sweet.
∴ All sweet things are not mangoes.
- (f) An ant is an animal.
∴ A big ant is a big animal.
- (g) Uneasy lies the head that wears a crown.
∴ Easy lies the head that wears no crown.
- (h) A shark is not a mammal.
∴ The food of a shark is not the food of a mammal.

CHAPTER XIV

General Nature of Syllogism.

1. Definition of syllogism : its characteristics.

A **Syllogism** may be defined as a form of mediate inference in which the conclusion follows from two premises, conjointly.

For example,

All men are mortal ;

Epicurus is a man ;

∴ Epicurus is mortal.

A Syllogism has the following characteristics :—

(1) *The conclusion of a syllogism follows from the two premises taken together and not from any one of them singly.* The word ‘syllogism’ etymologically means ‘a collecting together,’ which implies that the parts of a syllogism are thought together. Thus, in the above syllogism the conclusion ‘Epicurus is mortal’ follows from the premises only when they are considered together. We cannot conclude ‘Epicurus is mortal’ from the proposition ‘All men are mortal,’ unless we know that ‘Epicurus is a man,’ nor we can conclude ‘Epicurus is mortal’ from the proposition ‘Epicurus is a man,’ unless we know that ‘All men are mortal.’ This characteristic distinguishes syllogism from immediate inference in which the conclusion follows from a single premise.

It should, however, be noted that the conclusion of

a syllogism is not merely a sum of its two premises, but follows from them as a necessary consequence.

(2) *The premises of a syllogism from which the conclusion is drawn have a common element.* If they do not have a common element, there would be no bond of connection between them and it would not be possible to derive a new proposition from their combination. In the above example the common element is the term 'man' which appears in both the premises.

(3) *The conclusion of the syllogism cannot be more general than the premises.* This is the characteristic of all deductive reasoning and the syllogism cannot be an exception to it. By this characteristic syllogism is distinguished from inductive reasoning in which the conclusion is always more general than the premises.

(4) *In a syllogism the truth of its premises is assumed.* This again, is a characteristic of deductive logic in general. Deductive logic is not concerned with material truth. It does not enquire whether the given propositions in any reasoning are true or false. It takes the truth of the premises for granted, so that the conclusion derived from them is actually true if the premises be so, otherwise not. Therefore, the truth of the conclusion in a syllogism depends on the truth of the premises.

Distinction is usually made between the *form and matter of syllogism*. The matter is determined by its terms and the form by the relations between them. Since we are not concerned with the matter of syllogism, the terms are often represented by symbols. The conclusion follows as a necessary consequence from the *relations* between them. This illustrates the *purely formal character of syllogism*.

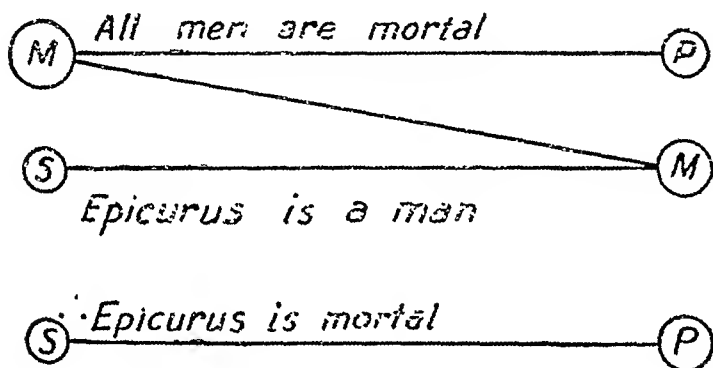
2. The Structure of Syllogism.

A syllogism consists of three propositions. Two of these propositions, which are given are called the *premises* and the proposition which is inferred from them is called the *conclusion*. Each proposition consists of two terms, and therefore, a syllogism should have six terms. But *it actually has only three terms*, each of which occurs twice. These are called the **Major Term**, the **Minor Term** and the **Middle Term**. The **Major Term** is the *predicate of the conclusion* and occurs in one of the premises. The **Minor Term** is the *subject of the conclusion* and it also occurs in one of the premises. The **Middle Term** does not occur in the conclusion, but it *occurs in both the premises*. The minor and the major terms, being the subject and the predicate of the conclusion are represented as **S** and **P**, while the middle term is represented as **M**. The major and the minor terms are also called the *extremes*. The middle term mediates between the two extremes or acts as an intermediary between them. Until the conclusion is reached the major and the minor terms stand apart from each other like two strangers. It is through the agency of the middle term that a relation is established between them. Only for this purpose the middle term occurs in both the premises. In one of them it is compared with the major term and in the other with the minor term. Thus, after the middle term has established a relation between the two extremes, it drops out in the conclusion, in which the extremes are shown as related to each other.

The premises are also distinguished by means of names. The premise in which the major term occurs is called the **Major Premise** while the premise, in which the minor term

occurs is called the **Minor Premise**. In the strictly logical form of syllogism the major premise comes first, the minor premise comes next and the conclusion comes at the end.

The different elements of a syllogism may be illustrated by means of the following example :—



Here 'Epicurus' and 'mortal' are respectively the minor and major terms, being the subject and the predicate of the conclusion. 'Man' is the middle term, because it is common to both the premises. 'All men are mortal' is the major premise, because the major term 'mortal' occurs in it; 'Epicurus is a man' is the minor premise because the minor term 'Epicurus' occurs in it. The middle term 'man' is compared with the major term 'mortal' in the major premise and with the minor term 'Epicurus' in the minor premise. In the conclusion the middle term drops out and the major and minor terms 'Epicurus' and 'mortal' are compared with each other.

3. Kinds of Syllogism.

Syllogisms have been classified into Pure and Mixed. A **Pure Syllogism** is one in which all the constituent propositions are of the same relation. Pure syllogisms are divided into three kinds :—

- (1) **Pure Categorical** in which all the constituent propositions are categorical.
- (2) **Pure Hypothetical**, in which all the constituent propositions are hypothetical, and
- (3) **Pure Disjunctive**, in which all the constituent propositions are disjunctive.

A **Mixed Syllogism** is one in which the constituent propositions are of different relations. Mixed Syllogisms are also divided into three kinds.

(1) **Hypothetical—Categorical**, in which the major premise is hypothetical and the minor and the conclusion are categorical.

(2) **Disjunctive—Categorical** in which the major premise is disjunctive and the minor and the conclusion are categorical, and

(3) **Dilemma** in which the major premise is a compound hypothetical, the minor premise is disjunctive and the conclusion, either categorical or disjunctive.

EXERCISE XIV

1. Define Syllogism. Show how it is the form of Mediate knowledge and Deductive reasoning (C. U. 1909).
2. What are the characteristics of the syllogism? (C. U. 1920).
3. Explain the parts of a categorical syllogism. What is the function of the middle term in a Syllogism?
4. State the meaning of the following :—the minor, the middle and the major terms of the syllogism. Explain the relations of these terms, illustrating your meaning by examples. (C. U. 1912).

CHAPTER XV

AXIOMS OF SYLLOGISM

1. The Aristotelian Dictum de Omni et Nullo.

The fundamental basis of syllogistic reasoning is Aristotle's "*Dictum de omni et nullo*" (Statement concerning all and none). The dictum may be expressed by saying :

"Whatever is affirmed or denied of a class, is affirmed or denied of any part of that class."

For example, whatever can be affirmed or denied of all men, can be affirmed or denied of some men, or of one man. If mortality can be affirmed of all men, it can be affirmed of Socrates, Plato or any other person; if perfection can be denied of all men, it can be denied of any particular person or persons.

It may be objected that when from 'All men are mortal' we infer 'Socrates is mortal' it is a case of immediate inference, and therefore, the dictum is an enunciation of that form of inference. But this is certainly not so, because the conclusion cannot be reached without the aid of the minor premise, which informs us that 'Socrates is a man.'

Another objection that may be made against the *dictum* is that it makes syllogistic reasoning rest exclusively on the extension of the concepts compared and not on intension, which is more important. But this objection does not hold provided we interpret 'class' in the sense of class *indefinite*,

as fixed by connotation. Bain has enunciated the *dictum* in the light of this meaning thus :—

“Whatever is true of a whole class (class indefinite, fixed by connotation), is true of whatever thing can be affirmed to come under or belong to the class (as ascertained by connotation).”

The dictum is directly applicable only to the First Figure, i.e. that form of syllogism in which the middle term is the subject in the major premise and predicate in the minor premise. The scholastic logicians regarded this type of syllogism as perfect. But since the other forms of syllogism could be reduced to the perfect or the standard type and their validity could be tested in this way the *dictum de omni* was regarded as the basis of all forms of syllogistic reasoning.

2. Axioms of Identity and Diversity.

Some logicians, following Whately, have laid down the following canons which apply alike to all the various forms of pure syllogism :

1. *Two ideas agreeing with the same third agree with each other.*

2. *Two ideas of which one agrees and the other does not agree with the same third do not agree with each other.*

These axioms are analogous to the mathematical axioms that “Two things which are equal to the same are equal to each other,” and “Two things, one of which is equal, the other unequal, to a same third thing, are unequal to each other. But these axioms are concerned with *quantities* and *magnitudes*, while the logical axioms are concerned with *ideas*.

The axioms of identity and diversity, however, are inadequate, because they refer primarily to the extension of the ideas and not to their intention.

3. General Rules or Canons of Syllogism.

The dictum, we have seen, is regarded as the ultimate basis of all kinds of syllogistic reasoning. But it is not sufficient for testing the validity of arguments and detecting fallacies in them. Therefore, six rules of syllogistic reasoning have been formulated. These rules are applicable to all forms of syllogism, and no syllogism in which any one of them is violated can be valid. They may be stated as follows:—

A. Rules of Structure :

- I. *A syllogism must contain three, and only three terms.*
- II. *A syllogism must consist of three and only three propositions.*

B. Rules of Quantity :

- III. *The middle term must be distributed in one at least of the premises.*
- IV. *No term must be distributed in the conclusion which is not distributed in a premise.*

C. Rules of Quality:

- V. *One at least of the premises must be affirmative.*
- VI. *A negative premise necessitates a negative conclusion and to prove a negative conclusion requires a negative premise.*

4. Examination of the General Rules of Syllogism.

Rules I-A syllogism must contain three and only three terms.

This is not a rule of syllogistic reasoning but an essential mark of it—a statement of its very nature. It follows from the definition of syllogism as ‘the comparison of two terms

by a third.' If an argument contains only two terms it is not a syllogism, but immediate inference. If it contains more than three terms, it is either a chain of syllogistic reasoning or no syllogism at all. In the latter case there is no middle term. Hence no conclusion can be drawn. For example,

All kings are mortal,

All horses are quadrupeds.

No conclusion can be drawn from these premises because there is no connecting link between them.

When in a syllogism there are more than three terms we have a fallacy usually called the **Fallacy of Four Terms** (though its more appropriate name would be *the fallacy of more than three terms.*) For example,

(a) A is the friend of B.

B is the friend of C.

∴ A is the friend of C.

Here we have four terms, 'A,' 'the friend of B,' 'B' and 'the friend of C.'

(b) The earth moves round the sun.

The moon moves round the earth.

∴ The moon moves round the sun.

Here the four terms are 'The earth,' 'The Planet which moves round the sun,' 'The moon' and 'The planet which moves round the earth.'

The Fallacy of Four Terms is some times due to the ambiguous use of a term. In such cases it is termed the *Fallacy of Equivocation*. We have seen that each term in a syllogism occurs twice. Each time it may be used in a different sense, thus representing two different

terms. When the major term is thus used, it is called the fallacy of **Ambiguous Major**. For example,

No courageous creature *flies*.

The eagle is a courageous creature.

∴ The eagle does not *fly*.

The word 'fly' is here used ambiguously, meaning 'running away out of fear' in the major premise and 'flying in the air like birds' in the conclusion.

When the minor term is used ambiguously, it is called the fallacy of **Ambiguous Minor**. For example,

No man is made of paper, .

All *pages* are men.

∴ No *pages* are made of paper.

Here 'pages' is used to mean 'boy servant' in the minor premise and 'pages of a book' in the conclusion.

When the middle term is used ambiguously it is called the fallacy of **Ambiguous Middle**. For example,

(a) All *kites* are very ugly birds.

The paper-made thing which I am flying is a *kite*.

∴ The paper-made thing which I am flying is a very ugly bird.

(b) *Sound* travels at 1120 feet per second.

His knowledge of law is *sound*.

∴ His knowledge of law travels at 1120 feet per second.

Rule II—A syllogism must consist of three and only three propositions.

This is also not a rule of syllogistic inference, but a rule for deciding whether a given argument is a syllogism at all. It follows directly from the definition of syllogism. If a deductive argument contains only two propositions it is a case of immediate inference. If it contains more.

than three propositions, either one of the propositions is redundant or the argument is a chain of reasoning which can be split up into more than one syllogism.

Rule III—The middle term must be distributed at least in one of the premises.

If the middle term is not distributed in any premise, there is no bond of connection between the major and the minor terms, from which a conclusion may be drawn. For, if the middle term is undistributed in both the premises, it means that a part of it is compared with the major term in the major premise and a part with the minor term in the minor premise; and there being no formal assurance that the same part is taken in both the premises, one part may be related to the major term and *another* part to the minor term. Thus in the example

All men are animals.

All asses are animals.

the middle term 'animals' is undistributed in both the premises. So, there is no bond of connection between the extremes 'men' and 'asses' and no conclusion follows. But if the middle term is distributed in one of the premises i.e., if the whole of it is given as related to one extreme, there is a necessary bond of connection between the two extremes. For, in that case whatever part is related to the other extreme that part must be related to both.

The violation of this rule leads to the fallacy of the **Undistributed Middle**. Examples :

(a) Sugar is *white*.

This powder is *white*.

∴ This powder is sugar.

- (b) All men are *mortal*.
All animals are *mortal*.
∴ All animals are men.
- (c) Some *men* are kings.
All philosophers are *men*.
∴ All philosophers are kings.

Rule IV—No term may be distributed in the conclusion which is not distributed in a premise.

If a term which is undistributed in the premise is distributed in the conclusion, it means that in the conclusion we make a statement about *all* the objects indicated by the term while the premise only refers to *some* of them, i.e., in the conclusion we introduce a reference to objects about which the premise says nothing. This is going against the very principle of deductive inference in which the conclusion cannot be more general than the premises.

The violation of this rule leads to the **Fallacy of Illicit Process**. It is called the *Illicit Process of the Major* or briefly, **Illicit Major**, when it is the major term which is distributed in the conclusion without being distributed in the premises. Examples :

- (a) All Rajputs are *brave*.
He is not a Rajput.
∴ He is not *brave*.
- (b) All men are *mortal*.
No quadrupeds are men.
∴ No quadrupeds are *mortal*.

If it is the minor term which is distributed in the conclusion but not distributed in the minor premise, the fallacy is called **Illicit Minor**. Examples :

- (a) All crows are ugly.
All crows are *black*.
∴ All *black things* are ugly.

- (b) All men are rational.
 All men are *animals*.
 \therefore All *animals* are rational.

It should be noted that the converse of this rule does not hold true i.e., if a term is distributed in the premise, it is not necessary that it should be distributed in the conclusion. In the conclusion it may or may not be distributed.

Rule V—One at least of the premises must be affirmative.

If both the premises are negative, it means that the major premise denies a relation between the major term and the middle term and the minor premise denies a relation between the minor term and the middle term, so that there is no common bond between the two extremes and no conclusion follows. It is only when one at least of the extremes is connected with the middle term that we can through that connection, infer its agreement or disagreement with the other extreme.

A violation of this rule leads to the fallacy of **Negative Premises**. For example, the fallacy would be committed if a conclusion is drawn from the following premises which are both negatives :—

No fools are philosophers.
 No kings are fools.

Rule VI—A negative premise necessitates a negative conclusion, and to prove a negative conclusion requires a negative premise.

If one of the premises is negative the other must be affirmative (Rule V). The affirmative premise states that there is a connection between the middle term and one of

the extremes ; the negative premise states that there is no connection between the middle term and the other extreme. If of the two extremes one agrees and the other does not agree with the same third term, it follows that they do not agree with each other. Thus in the conclusion a relation must be denied between them, i.e., *the conclusion must be negative.*

A negative conclusion implies that there is no connection between the two extremes. In the conclusion a connection between the two extremes can be denied only if the connection between one of the extremes and the middle term is denied in the premises, i.e. if one of the premises is negative. *Thus to prove a negative conclusion requires a negative premise.*

5. Corollaries from the Rules of Syllogism.

The six rules stated above are sufficient for detecting fallacies in syllogistic inferences, but there are four corollaries from these which are also useful for this purpose. They are :—

1. *If both the premises be affirmative, the conclusion must be affirmative and vice versa.*
2. *From two particular premises nothing can be inferred.*
3. *If one premise is particular, the conclusion must be particular.*
4. *From a particular major and a negative minor nothing can be inferred.*

We will now show how each of these can be proved with the help of the rules already given.

Cor. (a) If both the premises be affirmative the conclusion must be affirmative

Proof. Suppose the conclusion is not affirmative.

∴ It must be negative.

∴ One of the premises must be negative, by Rule VI.
But this cannot be by hypothesis.

∴ The conclusion cannot be negative.

∴ It is affirmative.

(b) If the conclusion be affirmative, both the premises must be affirmative.

Proof. Suppose one of the premises is negative.

∴ The conclusion must be negative, by Rule VI.
But this cannot be by hypothesis.

∴ Not one of the premises can be negative.

∴ Both the premises must be affirmative.

Cor. 2. From two particular premises, nothing can be inferred.

Proof. If both the premises be particular, the possible combinations are :—

II, OO, IO, and OI.

But II, premises distribute no term;

∴ The middle term must be undistributed;

∴ There is no conclusion.

OO cannot give any conclusion, by Rule V.

IO or OI distribute only one term, which must be the middle term (Rule III).

∴ The major term is undistributed in the premises.

∴ But one of the premises being negative the conclusion must be negative,

And every negative proposition distributes its predicate;

- ∴ The major term must be distributed in the conclusion.
- ∴ The fallacy of Illicit Major would arise.
- ∴ There is no conclusion.

Cor. 3. If One premise be particular, the conclusion must be particular.

Proof. If one of the premises be particular, the other must be universal (Cor. 2).

Then the possible combinations are.—

AI, IA, AO, OA; EI, IE, EO, OE.

Let us examine these combinations in groups.

AI, IA.—In each of these combinations only one term is distributed, which must be the middle term (Rule III).

- ∴ The minor term is undistributed in the premise.
- ∴ It must be undistributed in the conclusion (Rule IV).
- ∴ The conclusion must be particular.

AO, OA, EI, IE.—In each of these combinations only two terms are distributed.

One of these must be the middle term. (Rule III).

- ∴ Only one of the extremes is distributed in the premises.
 - But one premise is negative.
 - ∴ The conclusion must be negative.
 - ∴ The major term must be distributed in the conclusion.
 - ∴ The major term must be distributed in the premise.
 - ∴ The minor term must be undistributed in the premise.
 - ∴ The minor term cannot be distributed in the conclusion.
- Rule IV.
- ∴ The conclusion is particular.

EO, OE.—These combinations are excluded by Rule V.

Cor. 4. From a particular major and a negative minor nothing can be inferred.

Proof.—If the minor premise be negative, the major premise must be affirmative and the conclusion must be negative.

∴ The major term must be distributed in the conclusion.

But the major premise being affirmative particular does not distribute any term in it.

∴ The major term is undistributed in the premise.

∴ The fallacy of Illicit Major arises.

∴ There is no conclusion.

6. Derivation of the rules from the 'Dictum.'

The Dictum de omni et nullo, we have seen, applies directly to the syllogism in Fig. I (in which the middle term is the subject in the major premise and predicate in the minor premise) and through it to all other forms of syllogism. Therefore, all the rules of syllogism should be deducible from the dictum. We shall now show how the dictum contains all the rules. The dictum may be reproduced as follows:—

Whatever is distributively predicated, whether affirmatively or negatively, of any class, may be predicated, in like manner, of anything that can be asserted to belong to that class.

1. The dictum provides for three, and only three terms:—

(a) 'Whatever is predicated,' which corresponds to the major term.

(b) The 'class of which it is predicated' which corresponds to the middle term.

(c) 'Anything asserted to belong to that class' which corresponds to the minor term.

Thus we have the rule that *a syllogism must have three and only three terms.*

2. The dictum provides for three and only three propositions:—

(a) The proposition, in which the original predication is made of the class.—the Major Premise.

- (b) The proposition which declares something to be included in that class—the Minor Premise.
- (c) The proposition in which the original predication is made of that included something—the Conclusion.

This gives the rule that a syllogism must have three and only three propositions.

3. We have seen that the 'class' of which the original predication is made is the middle term (Sec. 1). The expression 'whatever is *distributively* predicated of a class' implies that the middle term is distributed in the major premise. This may be generalised to give the rule that *the middle term must be distributed in one, at least, of the premises.*

4. We have seen (Sec. 2) that the proposition in which the original predication is made of anything that can be asserted to belong to that class is the conclusion. It is here indicated that only the original predication is made in the conclusion and nothing more than it, and also that the original predication is made of 'anything which can be asserted to belong to that class,' and not of something *more indefinite than this* 'anything.' This implies that the conclusion cannot be more general than the premises. Hence the rule: *No term may be distributed in the conclusion which is not distributed in one of the premises.*

5. The minor premise declares that something is included in the 'class.' Thus the minor premise must be affirmative in the form of syllogism to which the dictum directly refers. Generalising this we get the rule: *One at least of the premises must be affirmative.*

6. The Dictum prescribes that the original predication which is made of 'a class' shall be made '*in like manner*' of anything that can be asserted to that class. Since, according to the Dictum, the minor premise must be affirmative (Sec. 5), this means that if the original predication, i.e., the major premise is affirmative, the conclusion must be affirmative, and if it is negative, the conclusion is negative. By generalising this, we get the rule that *a negative premise necessitates a negative conclusion and there cannot be a negative conclusion without a negative premise.*

7. Syllogism and the Laws of Thought.

Syllogism is ultimately based on the Laws of Thought which are involved in every formally correct reasoning. All affirmative categorical syllogisms are based on the Law of Identity, while all negative categorical syllogisms are based on the Law of Contradiction. Pure hypothetical syllogisms rest on the Principle of Sufficient Reason. The pure categorical syllogisms also may be shown to rest on the Principle of Sufficient Reason, in so far as the dependence of the conclusion on the premises may be expressed in the form of a hypothetical judgment, which is an application of the said principle.

The axioms of syllogism are the expansions of the Laws of Thought. The Axiom of Identity is an expansion of the Law of Identity; the Axiom of Diversity is an expansion of the Law of Contradiction; and the *dictum de omni* is an expansion of both.

EXERCISE XV

1. State and explain the *dictum de omni et nullo*. Show that the various rules of syllogistic reasoning are deductions from it. (U. P. B. 1941).

2. Prove that there can be no conclusion.

- (a) If the Middle term is undistributed in both the premises. (P. U. 1938).
- (b) If both the premises be particular. (P. U. 1925).
- (c) If both the premises be negative.

3. Prove that

- (a) The conclusion must be particular, if one of the premises be particular.
- (b) The conclusion must be negative, if one of the premises be negative.
- (c) The conclusion must be affirmative, if both the premises be affirmative.

4. Prove that in every syllogism

(a) If the minor premise is negative, the major must be universal.
(C. U. 1936.).

(b) If the major premise be particular affirmative and the minor premise be universal negative, no conclusion can be drawn.

5. Explain the meaning of Illicit Process in Reasoning and explain why it is that it makes a valid conclusion impossible. Illustrate your meaning by examples. Distinguish the different forms of Illicit Process and give an example of each.

CHAPTER XVI

Figure and Mood.

1. Figure of Syllogism.

Figure is the form of a syllogism as determined by the position of the middle term in the premisses.

There are four figures :

The *First Figure* is that in which the middle term is subject in the major premiss and predicate in the minor.

The *Second Figure* is that in which the middle term is predicate in both the premisses.

The *Third Figure* is that in which the middle term is subject in both premisses.

The *Fourth Figure* is that in which the middle term is predicate in the major premiss and subject in the minor.

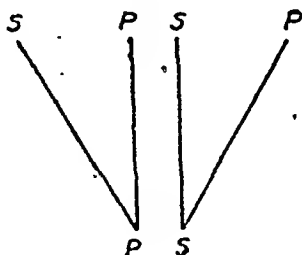
The above classification may be illustrated thus.

1st Fig.	2nd Fig.	3rd Fig.	4th Fig.
M P	P M	M P	P M
S M	S M	M S	M S

The position of the middle term in the four figures will be easily remembered with the help of the following (mnemonic ;) in which S denotes that the middle term is the subject, and P that it is predicate :—

$$SP_{(1)}-PP_{(2)}-SS_{(3)}-PS_{(4)}$$

The position of the middle term in the several figures may also be shown by means of the accompanying diagram resembling the letter W, in which S and P stand for the subject and the predicate respectively and the lines are to be followed from above downwards.



2. Mood of Syllogism.

Mood is the form of a syllogism as determined by the quality and the quantity of the constituent propositions. For example, the following syllogism is in the mood AAA.

All men are mortal. A

All kings are men. A

∴ All kings are mortal. A

The word 'mood' has also been used by logicians to mean the form of a syllogism as determined by the constituent premises (and not the conclusion).

Using the word 'mood' in the latter sense, we have sixteen possible moods in each figure, because any of the four propositions (A, E, I or O) may be taken as a major premise and joined with any of the same four as minor premise, thus :

A A	E A	I A	O A
A E	E E	I E	O E
A I	E I	I I	O I
A O	E O	I O	O O

But if we use the word 'mood' in the former sense and consider the conclusion also, we have *sixty four* moods in each figure, because to each of the sixteen combinations of premises we may again add any of the four propositions as conclusion, so that each combination of premises has four forms. Thus, for example A A may have the following four forms :—

A A A

A A E

A A I

A A O

Since there are four figures we have in this sense, $64 \times 4 = 256$ possible moods in all.

3. Determination of Valid Moods.

We shall presently see that all possible moods are not valid. Hence some logicians have used the word 'mood' in a restricted sense to mean only *valid moods*. We shall now determine which of the possible moods are valid.

Let us start with the sixteen moods as determined by the quality and quantity of the constituent premises. The sixteen possible moods are.

A A	E A	I A	O A
A E	E E	I E	O E .
A I	E I	I I	O I
A O	E O	I O	O O

Out of these, the moods EE, EO, OE and OO are invalid, because both the premises are negative ; the moods II, IO, OI are invalid, because both the premises are particular ; and the mood IE is invalid, because the major premise is particular and the minor premise is negative. Thus we are left with the following eight moods :—

AA, AE, AI, AO, EA, EI, IA, OA.

Combining each of these combinations of premises with the conclusion or conclusions that may legitimately follow from it, we get the following eight moods :—

- (1) AA gives A conclusion. Hence the mood AAA.
- (2) AE gives E conclusion. Hence the mood AEE.
- (3) AI gives I conclusion. Hence the mood AII.
- (4) AO gives O conclusion. Hence the mood AOO.
- (5) EA gives E conclusion. Hence the mood EAE.
- (6) EI gives O conclusion. Hence the mood EIO.
- (7) IA gives I conclusion. Hence the mood IAI.
- (8) OA gives O conclusion. Hence the mood OAO.

Of the above combinations of premises those which yield a universal conclusion can also give a particular conclusion of the same quality. Thus we have the following additional moods :—

AAI, AEO, EAO.

These are called Weakened Syllogisms or Subaltern Moods, because their conclusions can be inferred by subalternation from the universal conclusions of the corresponding syllogisms. But they are practically useless.

Each of these again does not lead to a valid conclusion in all the four figures, because if a particular combination of premises gives a universal conclusion, there is no sense in drawing a particular conclusion.

All the eight legitimate moods, again, are not valid in every figure. Some of them are valid in all the figures, others only in three figures or two figures or one figure. We shall have to determine the valid moods of each figure separately.

Valid Moods of the First Figure.

In the first figure the middle term is the subject in the major premise and the predicate in the minor premise. Expanding each of the eight legitimate moods in the first figure, we have the following syllogisms.

AAA

(1) A. All M is P.

A. All S is M.

∴ A. All S is P (*valid*).

AEE

(2) A. All M is P

E. No S is M.

∴ E. No S is P (*Illicit Major*).

AII

(3) A. All M is P.

I. Some S is M

∴ I. Some S is P (*valid*)

AOO

(4) A. All M is P.

O. Some S is not M.

∴ O. Some S is not P.
(*Illicit Major*).

EAE

(5) E. No M is P

A. All S is M

∴ E. No S is P (*valid*)

EIO

(6) E. No M is P.

I. Some S is M.

∴ O. Some S is not P (*valid*).

IAI

(7) I. Some M is P.

A. All S is M

∴ I. Some S is P

*(Undistributed middle)***OAo**

(8) O. Some M is not P.

A. All S is M

∴ O. Some S is P

(Undistributed middle).

It is clear that in the first figure the moods

AAA, EAE, AII and **EIO** are valid and all other moods are invalid. The moods **AEE** and **AOO** are invalid, because the fallacy of Illicit Major occurs; the moods **IAI** and **OAo** are invalid, because the fallacy of Undistributed Middle occurs.

Valid Moods of the Second Figure.

In the second figure the middle term is the predicate in both the premises. Expanding the eight legitimate moods in the second figure we have the following syllogisms.

AAA

(1) A. All P is M.

A. All S is M.

∴ A. All S is P

*(Undistributed middle)***AEE**

(2) A. All P is M.

E. No S is M.

∴ E. No S is P.

*(valid)***AII**

(3) A. All P is M

I. Some S is M.

∴ I. Some S is P.

*(Undistributed middle)***AOO**

(4) A. All P is M.

O. Some S is not M.

∴ O. Some S is Not P

(valid)

EAE

EIO

(5) E. No P is M

(6) E. No P is M

A. All S is M

I. Some S is M

∴ E. No S is P (*valid*)∴ O. Some S is not P.
(*valid*)

IAI

OAO

(7) I. Some P is M.

(8) O. Some P is not M.

A All S is M

A. All S is M.

∴ I, Some S is P.

∴ O Some S is not P.

*(Undistributed Middle)**(Illicit Major)*

Thus in the second figure the following moods are valid:—

EAE, AEE, EIO, AOO.

Valid Moods in each Figure and their Names :

In the same manner we can determine the valid moods in the third and the fourth figures. Valid moods in each figure are shown in the table below. It will appear that there are altogether *nineteen* valid moods (or twenty four, including the five subaltern moods which are enclosed in brackets). The mnemonic name of each valid mood by which it can be easily remembered is given just below it. The first vowel in the names represents the major premise, the second represents the minor premise and the third represents the conclusion.

Fig. 1.	AAA, EAE, AII, EIO, [AAI], [EAO]. <i>Barbara, Celarent, Darī, Ferio</i> ;
Fig. 2.	[EAE, AEE, EIO, AOO, [EAO], [AEO]. <i>Cesare, Camestres, Festino, Baroco</i> ;
Fig. 3.	AAI, IAI, AII, EAO, OAO, EIO. <i>Darapti, Disamis, Datisi, Felapton, Bocardo, Ferison</i>
Fig. 4.	AAI, AEE, IAI, EAO, EIO, [AEO]. <i>Bramantip, Camenes, Dimaris, Fesapo, Fresion.</i>

4. Weakened, Strengthened and Fundamental Syllogisms.

A Weakened Syllogism or Subaltern Mood is one which draws a particular conclusion from premises which justify a universal conclusion. Out of nineteen valid moods in the four figures there are five which have a universal conclusion, viz., *Barbara, Celarent, Cesare, Camestres, Camenes*. All these syllogisms may be weakened by substituting a particular conclusion in the place of the universal, and the weakened syllogisms may be named *Barbari, Celaront, Cesaro, Camestors and Camenos*.

A Strengthened Syllogism is one in which one of the premises is stronger than what is required to prove the conclusion. In a Strengthened Syllogism some term is unnecessarily distributed in the premises i.e., it is distributed though its distribution is not required to establish the conclusion. The strengthened syllogisms are *Darapti* and *Felapton* in Fig. 3, and *Fesapo* and *Bramantip* in Fig. 4. In *Darapti, Felapton* and *Fesapo*, the middle term is distributed twice; in *Bramantip* the

major term is distributed in the premise, but not in the conclusion. Besides these four moods *all the subalterm moods except Camenos in Fig. 4 are also strengthened syllogisms*. In Camenso (AEO), if the major premise be particular, we have the fallacy of Illicit Major; if the minor premise be particular we have the fallacy of undistributed middle. Here the same premises are required for the particular conclusion as for the universal. Thus

Camenos.	Comenes.
All P is M.	All P is M.
No M is S	No M is S.
∴ Some S is not P.	∴ No S is P.

The distinction between Strengthened and Weakened Syllogisms should be carefully noted. A strengthened Syllogism is a syllogism with *strengthened premises* while a Weakened Syllogism or Subalterm Mood is a syllogism with *weakened conclusion*.

A Fundamental Syllogism is one in which neither premise is stronger than is necessary to prove the conclusion. In a Fundamental Syllogism the middle term is distributed only once, and neither of the extremes is distributed in the premises without being distributed in the conclusion. Out of nineteen valid moods only four viz., *Darapti*, *Felapton*, *Brarrantip* and *Fesapo* are non-fundamental or strengthened and the remaining fifteen are fundamental.

5. Special Rules of the Four Figures.

Each of the four figures has its own special rules which follow from the general rules of syllogism taken in connection with the specific form of each figure.

Figure 1

$$\begin{array}{c} M-P \\ S-M \\ \hline S-P \end{array}$$

Rule 1. The minor premiss must be affirmative.

Proof: If possible, let the minor premiss be negative. Then the major premiss must be affirmative (Rule V), and the conclusion must be negative (Rule VI).

- ∴ The major term will be distributed in the conclusion and undistributed in the premiss.
- ∴ There will be the fallacy of Illicit Major.
- ∴ The minor premise cannot be negative.
- ∴ It must be affirmative.

Rule 2. The major premiss must be universal.

Proof: Since the minor premise is affirmative it does not distribute its predicate which is the middle term.

- ∴ The middle term must be distributed in the major premiss.

But the middle term is subject in the major premiss.

- ∴ The major premiss must be universal.

Figure II

$$\begin{array}{c} P-M \\ S-M \\ \hline S-P \end{array}$$

Rule 1. One premiss must be negative.

Proof: If both the premises be affirmative, the middle term will be undistributed.

- ∴ One premiss must be negative.

Rule 2. The major premiss must be universal.

Proof: Since one premiss is negative, the conclusion must be negative.

- ∴ The major term is distributed in the conclusion.
- ∴ It must be distributed in the major premiss.

But in the major premiss The major term is
The subject.

- ∴ The major premiss must be universal.

Figure III

$$\begin{array}{r} M-P \\ M-S \\ \hline S-P \end{array}$$

Rule 1. The minor premiss must be affirmative.

Proof: If the minor premiss be negative, the conclusion must be negative, and the major premiss must be affirmative.

- ∴ There will be the fallacy of Illicit Major
- ∴ The minor premiss must be affirmative

Rule 2. The conclusion must be particular.

Proof: Since the minor premiss is affirmative, the predicate, which is the major term is undistributed.

- ∴ The major term must be undistributed in the conclusion.
- ∴ The conclusion must be particular.

Figure IV

$$\begin{array}{r} P-M \\ M-S \\ \hline S-P \end{array}$$

Rule 1. If the major premiss is affirmative, the minor must be universal.

Proof: If the major premiss be affirmative, the middle term in it will be undistributed.

∴ The middle term must be distributed in the minor premiss.

But in the minor premiss the middle term is the subject

∴ The minor premiss must be universal.

Rule 2. If the minor premiss be affirmative, the conclusion must be particular.

Proof: If the minor premiss be affirmative, the minor term will be undistributed in it.

∴ It must be undistributed in the conclusion.

∴ The conclusion must be particular.

Rule 3. If either premiss be negative, the major must be universal.

Proof: If either premiss be negative, the conclusion will be negative (Rule VI).

∴ The major term would be distributed in the conclusion.

∴ The major term must be distributed in the premiss.

But the major term is subject in the major premiss.

∴ The major premiss must be universal.

6. Spécial characteristics and uses of each Figure.

Figure 1

The scholastic logicians regarded the first figure as the *Perfect Figure*. Its superiority over other figures is due to :—

(a) It is the only figure to which the *Dictum de omni et nullo* applies directly. The dictum provides for a universal

major premise, since it presupposes that something is predicated of a *class distributively*, and for an affirmative minor premise, because it assumes that there is something that *can be asserted* to belong to that class. These two conditions are fulfilled only by the first figure of which the special rules are.

- (1) The major premise must be universal, and
- (2) The minor premise must be affirmative.

(b) It alone *can prove all kinds of propositions, i.e., A, E, I, and O*. A glance at the mnemonic verses will show this clearly.

(c) It is the only figure which proves an *A* conclusion. Since the main task of science is to establish propositions of this type, the first figure is also characterised as the *scientific figure*. It is very useful in proving the properties or qualities of objects.

(d) It is the only figure in which the extremes do not suffer an inversion of position, the minor term being the subject and the major term predicate, both in the premise and in the conclusion. Consequently this is the only figure in which there is no inversion of thought. If a term is taken denotatively in the premiss it is taken denotatively in the conclusion. If it is taken connotatively in the premise it is taken connotatively in the conclusion. From this point of view this figure is also the *most natural*.

Figure II

Figure II *proves only negative conclusions*. It is therefore useful for establishing distinctions between things and rejecting suggested assertions about given subjects. It has been called an *Exclusive Figure* or the *Figure of Denial*.

By means of it we may go on denying various suppositions as to the nature of a thing till ultimately we are left with the one right supposition.

Figure III

Figure III *can prove only particular conclusions*. It is, best fitted for proving exceptions, which are always particular statements. It is, therefore, called *Exceptive Figure*.

It is the only figure in which a singular name can be a subject in both the premisses. For example,

Mahatma Gandhi is a politician.

Mahatma Gandhi is a philosopher.

∴ One philosopher at least is a politician. (Darapti).

Figure IV

The Fourth Figure is *most unnatural*. In it there is complete inversion of thought. The minor term which is subject in the conclusion is predicate in the premiss, and the major term which is predicate in the conclusion is the subject in the premiss.

This figure is also superfluous. It was not recognised by Aristotle. It was introduced by Galen some centuries later. Its value is only theoretical. It is a possible arrangement of terms, which we have to take into account to complete the formal doctrine of figure.

7. Pure Hypothetical and Pure Disjunctive Syllogisms.

A **Pure Hypothetical Syllogism** is one in which a hypothetical conclusion is drawn from two hypothetical premisses. We have seen that hypothetical

propositions admit of the same distinctions of *quantity* and *quality* as categorical propositions, the antecedent and the consequent of a hypothetical proposition corresponding to the subject and the predicate of a categorical. Therefore it is possible to have as many forms of Pure Hypothetical Syllogism as of Pure Categorical syllogism, and the rules of Pure Categorical Syllogism apply, equally to Pure Hypothetical Syllogisms. For example, corresponding to *Barbara*, we have the form,

If any S is X, that S is P,
If any S is M, that S is X,
∴ If any S is M, that S is P.

Professor Welton gives the following material example of *Barbara* :

“If any person is selfish, he is unhappy ; if any child is spoilt, that child is selfish ; therefore if any child is spoilt he is happy.”

Pure Hypothetical Syllogisms can always be reduced to the categorical form, but this can be done more conveniently when the constituent propositions are quantified.

A Pure Disjunctive Syllogism is one in which a disjunctive conclusion is drawn from two disjunctive premises. The distinctions of figure do not apply to such syllogisms because the order of alternatives is not fixed, and they are possible in the affirmative moods only, because all disjunctive propositions are affirmative.

Example :

S is either P or Q, John is either wicked or foolish.
S is either P or R. John is either wicked or blockheaded.
∴ S is either Q or R. ∴ John is either foolish or block-headed.

Such syllogisms, however, are very rare.

8. Hints for working out Exercises on Syllogistic Reasonings.

When required to examine a syllogistic argument, we should first reduce it to its logical form. If any of th^e

constituent propositions is suppressed it should be supplied,* and all the propositions should be expressed clearly in strict logical form. The major premise should be stated first, the minor premise should come next and the conclusion should be stated last. But it would be convenient to look for the conclusion first and find out the major and the minor terms. These will enable us to find out the major and the the minor premises, for the major premise is that which contains the major term and the minor premise is that which contains the minor term.

When the argument is thus reduced to the logical form, we have to see whether the rules of syllogism have been observed. If the rules have been observed, the syllogism is *formally* valid. The most important rules are the rules regarding the distribution of terms, and the most important fallacies are the corresponding fallacies of the *Undistributed Middle*, the *Illicit Process of the Major* and the *Illicit Process of the Minor*.

9. Examples worked out :—

Sec. I

Examine the following arguments :—

(1) He can be selected for the post, for he is a graduate and only graduates [can be selected for it.

Answer.—The conclusion, here, is 'He can be selected for the post'. In the logical form it may be stated as 'He is a man who can be selected for the post.' This is an A proposition. 'He' the subject of the conclusion is the minor term. Therefore, the minor premise is the proposition in which 'He' occurs, viz., the proposition 'He is a graduate.' This is in logical form and is an A proposition. The predicate of the conclusion 'A man who can be selected for the post' is the major term. Therefore, the proposition in which it occurs, i.e., the proposition 'Only gra-

* A syllogism in which one or two of the constituent propositions are suppressed is called an *Enthymeme*. For exercises on Enthymeme see Chap. XIX.

duates can be selected for the post' is the major premise. Reduced to strict logical form it stands as 'All those who can be selected for the post are graduates.' This also is an A proposition. Thus the argument may be expressed in logical form as follows:—

A All those who can be selected for the post *are* graduates;

A He *is* a graduate;

A ∴ He *is* a man who can be selected for the post.

Now on examination we find that the middle term 'graduates' is not distributed even once, since both the premises are affirmative and in both it is the predicate. The argument, therefore, involves the *fallacy of Undistributed Middle*.

(2) All Indians are nationalists, since all members of the Indian National Congress are nationalists, and only Indians are members of the Congress.

Answer.—The conclusion is 'All Indians are nationalists, This is in logical form. The major term is 'nationalists.' Therefore, the major premise is the proposition 'All members of the Indian National Congress are nationalists.' The minor term is 'Indians.' Therefore the minor premise is 'Only Indians are members of the congress.' Reduced to logical form it stands as 'All members of the Indian National Congress are Indians.' Thus the whole argument may be expressed in logical form as follows:—

A All members of the Indian National Congress *are* nationalists.

A All members of the Indian National Congress *are* Indians

A ∴ All Indians *are* nationalists.

Here, we find that the minor term 'Indians' is distributed in the conclusion, which is a universal proposition and in which it stands as the subject, while it is undistributed in the minor premise which is an affirmative propo-

position and in which it stands as the predicate. Therefore, the argument involves the *fallacy of Illicit Process of the Minor*.

- (3) All independent countries are prosperous;
 India is not independent; therefore, India is
 not prosperous.

Answer—Reduced to logical form the argument stands thus :—

A All independent countries *are* prosperous ;

E India *is* not independent ;

E. ∴ India *is* not prosperous.

We find that the major term ' prosperous ' is distributed in the conclusion (being the predicate of a negative proposition), but it is undistributed in the major premise (being the predicate of an affirmative proposition). Therefore, the argument involves the *fallacy of Illicit Process of the Major Term*.

- (4) None but the wise are good, none but the good
 are happy. Therefore none but the wise are
 happy.

Answer.—Reduced to logical form the argument stands thus :—

A All good men *are* wise.

A All happy men *are* good.

∴ All happy men *are* wise.

This argument is *valid*.

- (5) **The General rules the army; the General's wife rules the General. Therefore, the General's wife rules the army.**

Answer.—Reduced to logical form the argument stands thus :—

A The General *is* a person who rules the army.

A The General's wife *is* a person who rules the General.

A ∴ The General's wife *is* a person who rules the army.

This argument contains four terms, namely (1) The General, (2) a person who rules the army, (3) the General's wife and (4) a person who rules the general. Therefore it involves the *fallacy of Four Terms*.

- (6) **Feather dispels darkness, because it is light, and light dispels darkness.**

Answer :—Reduced to logical form the argument stands thus.—

A Light *is* a thing that dispels darkness ;

A Feather *is* light ;

A ∴ Feather *is* a thing that dispels darkness.

It involves the *fallacy of Ambiguous Middle*, because the middle term *light* is used ambiguously. In the major premise it is opposed to 'darkness,' in the minor premise it is opposed to 'heavy.'

- (7) **No wise beings are men; for no men are quadrupeds, and no quadrupeds are wise.**

Answer.—Reduced to logical form the argument stands thus :—

E No men *are* quadrupeds.

E No quadrupeds *are* wise.

∴ No wise beings *are* men.

The argument involves the *Fallacy of Two Negatives*.

- (8) None but the Hindus worship Shiva. All Brahmins are Hindus. Therefore all Brahmins worship Shiva (P U: 1925).

Answer.—Logical form :—

A All those who worship Shiva *are* Hindus.

A All Brahmins *are* Hindus.

A \therefore All Brahmins *are* those who worship Shiva.

Here the middle term 'Hindu' is predicate in both the premises, which are affirmative. Therefore it remains undistributed in both, and the fallacy of *Undistributed Middle* arises.

- (9) If only the ignorant despise knowledge, this man cannot be ignorant, for he praises it

Answer.—Logical Form :—

A All those who despise knowledge *are* ignorant.

E This man *is not* one who despises knowledge.

E \therefore This man *is not* ignorant.

The argument involves the fallacy of *Illicit Major*, because the major term 'ignorant' is distributed in the conclusion, being the predicate of a negative proposition, but it is not distributed in the major premise, being the predicate of an affirmative proposition.

- (10) No animals are perfect ; for no men are perfect, and all men are animals.

Answer.—Logical Form :—

E No men *are* perfect.

A All men *are* animals.

E \therefore No animals *are* perfect.

The minor term 'animal' is not distributed in the minor premise, but is distributed in the conclusion. Hence the argument involves the fallacy of *Illicit Minor*.

(11) **John must be thoroughly honest, since he denounces evil and only those who denounce evil are known to be honest.**

Answer.—Logical Form :—

A All honest persons *are* those who denounce evil.

A He *is* a man who denounces evil.

A \therefore He *is* honest.

This involves the fallacy of *Undistributed Middle*.

(12) **All that is produced by labour should go to labour. All wealth is produced by labour. Hence all wealth should go to labour.**

Answer.—Logical Form :—

A All that is produced by labour *is* that which should go to labour.

A All wealth *is* that which is produced by labour.

A \therefore All wealth *is* that which should go to labour.

The argument involves the fallacy of *Ambiguous Major*. The major term 'labour' is not used in the same sense in the premise and the conclusion. In the premise it is used in the general sense to mean all those who work in any manner. In the conclusion it means the special class of people who do manual labour.

Sec. II.

(1) **Show that O cannot be a premise in Fig. I**

Proof :— (a) If O be the major premise, the minor premise must be A.

- for neither can both the premises be particular nor can both be negative.

O M—P The *middle term is undistributed* in both the pre-
A S—M : mises.

O S—P ∴ No conclusion follows.

(b) If O be the minor premise, the major must be A,
and the conclusion must be O.

A M—P ∴ The major term is distributed in the conclusion,
O S—M but it is not distributed in the major premise.

O S—P ∴ We have the fallacy of *Illicit Major*.

∴ No conclusion follows.

(2) Prove that O cannot be a premise in Fig. IV

Proof:— (a) If O be the major premise, the minor premise

O P—M must be A, and the conclusion must be O.

A M—S The major term would be distributed in the

O S—P ∴ conclusion, but undistributed in the premise.

∴ There will be the fallacy of *Illicit Major*.

∴ O cannot be the major premise.

(b) If O be the minor premise, the major premise must
A P—M be A, and the conclusion must be O.

O M—S ∴ The Middle Term which is the subject in the

O S—P minor premise and the predicate in the major
premise, remains undistributed in both.

∴ There is the fallacy of undistributed Middle.

∴ O cannot be the minor premise.

(3) Prove that O can be the major premise only in Fig. III.

Proof:— If O be the major premise, the minor premise
must be A, and the conclusion must be O.

(a) In Fig. I, this combination leads to the

- O M—P fallacy of Undistributed Middle, because
 A S—M the middle term, which is the subject in the
 O S—P major premise, and the predicate in the minor
 premise remains undistributed in both.

∴ O cannot be the major premise in Fig. I.

- O P—M (b) In Fig. II, this combination leads to the
 A S—M fallacy of Illicit Major, because the major term
 O S—P is distributed in the conclusion but undistributed
 in the premise.

∴ O cannot be the major premise in Fig. II.

- O P—M (c) In Fig. IV this combination leads to the
 A M—S fallacy of Illicit Major.

- O S—P ∴ O cannot be the major premise in Fig. IV
 (d) In Fig. III, the major term being the predi-

- O M—P cate in the major premise, which is negative,
 A M—S is distributed in it. The middle term is distri-
 O S—P buted in the minor premise. No other rule
 of syllogism is violated.

∴ O can be the major premise in Fig. III.

4. Prove that, in every figure, if the minor premise be negative, the major must be universal.

Proof:— If the minor premise be negative, the major premise must be affirmative, and the conclusion must be negative.

∴ The major term would be distributed in the conclusion.

∴ It must be distributed in the major premise. But the major premise¹ is affirmative, and it can distribute only its subject, and that only when it is universal.

∴ The major term must be the subject of the major premise, and the major premise must be universal.

5. Prove that A can be a conclusion only in fig. I.

Proof.—If the conclusion be A, both the premises must be A.

Since A distributes its subject, the major term is distributed in the conclusion.

∴ It must be distributed in the minor premise.

∴ It must be the subject in the minor premise (it being A).

∴ *The middle term must be the predicate in the minor premise* and it must be undistributed.

∴ It must be distributed in the major premise.

∴ *It must be the subject in the major premise.*

∴ The syllogism must be in Fig. I.

6. Show that if the middle term is twice distributed the conclusion cannot be universal.

Proof.—Let us suppose that the middle term is distributed twice and the conclusion is universal.

If the conclusion is universal it must either be A or E.

(a) *If the conclusion be A*, both the premises must be affirmative.

∴ The premises cannot distribute more than two terms.

Both these terms must be the middle term (by hypothesis).

∴ The minor term remains undistributed in the premise.

But the minor term is distributed in the conclusion.

∴ We have the fallacy of Illicit Minor.

(b) *If the conclusion be E*, one of the premises must be A and the other must be E.

∴ Three terms will be distributed in the premises.

Two of these must be the middle term (by hypothesis).

∴ One extreme can be distributed in the premises:

But in the conclusion both the extremes are distributed.

∴ We have the fallacy of illicit process of either the major or the minor.

Thus, if the middle term is distributed twice, the conclusion cannot be universal.

7. Ascertain the syllogisms that distribute only one term and that only once.

If only one term is distributed, it must be the middle term.

∴ Both the extremes must be undistributed in the premises.

∴ They must be undistributed in the conclusion.

∴ The conclusion must be I.

∴ Both the premises must be affirmative.

But since only one term is distributed in the premises, one of them must be A and the other must be I.

∴ The possible combinations are AII, IAI.

If the combination be AII, the middle term must be the subject in the major premise, and it may be either the subject or the predicate in the minor premises.

∴ AII may either be in the third figure (*Datisi*) or in the first figure (*Darii*).

If the combination be IAI, the middle term must be the subject in the minor premise, and it may be either the subject or the predicate in the major premise.

∴ IAI, may be either in Fig. III (*Disamis*) or in Fig. IV (*Dimaris*).

Thus the syllogisms are AII in Fig. I and Fig. III, and IAI in Fig. III and Fig. IV (*i.e.*, the moods *Darii*, *Datisi*, *Dimaris* and *Disamis*).

8. Ascertain the syllogisms which distributes one term and that twice

If only one term is distributed and that twice it must be the middle term, and it must be distributed in both the premises.

∴ The extremes must remain undistributed in the premises.

∴ They must be undistributed in the conclusion.

∴ The conclusion must be I.

∴ The premises must be affirmative.

Since the middle term is distributed in both the premises, they must be affirmative universal, *i.e.*, AA, and the middle term must be the subject in both.

Thus the syllogism must be AAI in Fig. III, *i.e.*, *Darapti*.

9. If two terms are distributed and each only once, what mood and figure are possible?

If only two terms are distributed and each only once, it follows that no term is distributed in the conclusion, for if a term be distributed in the conclusion, it must again be distributed in the premise, and thus it would be distributed twice, *i.e.*, the conclusion is I.

∴ Both the premises must be affirmative.

Since two terms are distributed in the premises and each only once, the premises must both be universal affirmative *i.e.*, A A' and each must distribute a term which is not distributed in the other.

One of these terms must be the middle term.

The middle term may be distributed in the major premise or in the minor premise.

If it is distributed in the major premise it must be undistributed in the minor premise, and if it is distributed in the minor premise it must be undistributed in the major premise.

Since only the subjects of the premises are here distributed, the position of the middle term must either be subject in the major premise and predicate in the minor (Fig. I) or predicate in the major premise and subject in the minor (Fig. IV).

Thus the possible syllogisms are AAI in Fig. I, i.e., *Barbari* and AAI in Fig. IV i.e., *Bramantip*.

10. Ascertain the syllogisms which distribute two terms and each twice.

If two terms are distributed and each twice, one of these must be the middle term and it must be distributed in both the premises, and the other must be one of the extremes, which must be distributed in the premise and in the conclusion.

Thus in one of the premises two terms will be distributed, (the middle term and one of the extremes.)

∴ One of the premises must be E, which alone distributes both the terms.

∴ The conclusion must be negative.

Since only one of the extremes is distributed, the conclusion cannot be E.

∴ It must be O.

∴ The major term is distributed in the conclusion.

∴ It must be distributed in the premise.

∴ The premise which distributes two terms must be the major premise, i.e., the major premise is E.

∴ The minor premise must be affirmative; and since it distributes the middle term and I does not distribute any term it must be A.

Thus the syllogism must be in the mood EAO.

The middle term must be the subject in the minor premise (otherwise it would not be distributed) and either the subject or the predicate in the major premise.

∴ The syllogism must be in Fig. III or in Fig. IV.

∴ The syllogisms are EAO in Fig. III, i.e., *Felapton*, and EAO in Fig. IV, i.e. the *Fesapo*.

11. Given that the major premise of a valid syllogism is affirmative and the major term is distributed twice while the minor term is not distributed even once; determine the syllogism.

Since the major term is distributed in the conclusion but the minor term is not, the conclusion must be O.

Since the major premise is affirmative with the major term distributed, it must be A, and the major term must be its subject.

∴ The middle term must be the predicate in the major premise and it must be undistributed.

∴ The middle term must be distributed in the minor premise.

Since the conclusion is negative and the major premise is affirmative, the minor must be negative.

Since, in the minor premise, the middle term is distributed and the minor term is not (by hypothesis), the

minor premise must be O, with the middle term as its predicate.

Thus we have a syllogism in the mood AOO, in Fig. II i.e., Baroco.

12. If the major term of a syllogism be the predicate of the major premise, what can you say about the minor premise?

The major term is either distributed or undistributed.

If the major term is distributed, the major premise must be negative (because negative propositions alone distribute their predicate) and the minor premise must be affirmative.

If the major term is undistributed in the major premise, it must be undistributed in the conclusion, which must, therefore be affirmative; and the conclusion being affirmative both the premises must be affirmative.

Thus in either case the minor premise must be affirmative.

13. Prove that if the middle term be distributed in both the premises the conclusion cannot be universal,

Proof:—If the conclusion be universal, it must be A or E.

(i) If the conclusion be A, both the premises must be A.

∴ Only two terms can be distributed in the premises, and since the middle term is distributed twice, the minor term cannot be distributed in the premise. But the minor term is distributed in the conclusion.

∴ We have the fallacy Illicit Minor.

(ii) If the conclusion be E, the premises must be E and A.

∴ Only three terms will be distributed in the premises; and since the middle term is distributed twice, only one other

term, i.e., either the major term or the minor term can be distributed.

But in the conclusion both the major and minor terms are distributed.

∴ Either the fallacy of Illicit Major or the fallacy of Illicit Minor will arise.

∴ The conclusion cannot be universal, if the middle term is distributed twice.

EXERCISE XVI

A

1. Define Figure and Mood. Briefly indicate the process by which the valid moods are determined.
2. What are Subalterm Moods? Why are they so called?
(C. U. 1934).
3. Explain the special rules of the first figure. (C. U. 1938).
4. Determine the number of possible figures and explain the special characteristics of each.
5. Test E. A. E. in each figure (C. U. 1921).
6. Prove that if the conclusion be A, the argument must be in the first figure (C. U. 1919).
7. Prove by means of the syllogistic rules that the conclusion in the second figure must be negative. (C. U. 1934).
8. Explain why the third figure can give only particular conclusions.
9. Prove that in the second figure the major premise must be universal.
10. Prove that the minor premise must be affirmative in the first and third figures.
11. Prove that if the conclusion be universal, the middle term can be distributed only once in the premises.
12. Prove that O cannot be a minor premise in any figure other than the second figure.

13. If the major term of a syllogism be the predicate of the major premise, what do you know about the minor premise.

B

1. Examine the following arguments and name the fallacies involved:—

(a) Teetotalers do not use alcoholic drinks, and this man does not do so; therefore, he is a teetotaler.

(b) 'Every egg comes from a hen and every hen comes from an egg. Therefore every egg comes from an egg'—*Whately*.

(c) All warm countries produce wine. Russia is not a warm country. Therefore Russia does not produce wine.

(d) Birds have wings. Flying fishes are not birds, therefore flying fishes have no wings.

(e) You are not the same kind of person as I am. I am a Rajput. Therefore you cannot be a Rajput.

(f) Truth always triumphs; this theory has triumphed; therefore, it is true.

(g) All cold is to be expelled by heat: this person's disorder is a cold; and must therefore be expelled by heat.

(2) Test the following arguments:—

(a) This bright flower is from the east, for the flora of eastern countries have bright colours.

(b) Wicked men are not to be trusted. He is not to be trusted. Therefore he must be a wicked man.

(c) Four-legged things are brutes; tables are four-legged things; therefore tables are brutes.—*Stock*.

(d) Every planet moves round the sun; Jupiter moves round the sun; therefore, Jupiter is a planet.

(e) All tulips are beautiful flowers, so roses are tulip; therefore no roses are beautiful flowers.

(f) No entertaining persons can be trusted; for some liars are entertaining and no liars can be trusted.

(g) He is an old man and he must be talkative, as old men are generally subject to this fault.

(h) All plants are organised; no crystals are plant; therefore no crystals are organised.

3. Examine the following arguments carefully analysing each and pointing out fallacies, if any :—

(a) What we produce is property. The police produces a prisoner, Therefore a prisoner is property.

(b) To call you an *animal* is to speak the truth. To call you a *goose* is to call you an animal. Therefore to call you a goose is to speak the truth.

(c) He that is of God heareth my word, ye therefore hear them not, because ye are not of God.

(d) What is produced by man's labour is property. The horse is not produced by man's labour. Therefore, the horse is not property.

(e) The powder must be sugar, for it is white and sugar is white.

(f) Nothing is better than honour. Dry bread is better than nothing. Therefore dry bread is better than honour. (P. U. 1929).

(g) James is not rich, for James is not fashionable, and only the rich are fashionable.

4. Examine the following arguments :—

(a) The crime was committed by the criminal; the criminal was committed by the magistrate; therefore the crime was committed by the magistrate.

(b) Cloven feet being found universally in horned animals, we may conclude that this fossil animal, since it appears to have had cloven feet, was horned.

(c) Solon was really competent to rule, for we know he was wise and it is the wise only who are fitted to rule.

(d) We cannot say he is good because he is clever, for there are some clever men who are not good.

(e) Shila is a rich man's wife. Sarla being different from Shila is not a rich man's wife.

CHAPTER XVII

REDUCTION OF SYLLOGISMS

1. The Nature and Aim of Reduction.

Reduction in the wider sense means transformation of the moods of any figure into the moods of any other figure, or even the transformation, of a mood of any figure into another mood of the same figure. But the term 'reduction' is generally used in the scholastic sense in which it means transformation of a mood of some other figure into a mood of the first figure.

Aristotle and the scholastics regarded the first figure as the only perfect figure. Therefore, they thought that the validity of a syllogism not expressed in the first figure could not be determined without reducing it to the first figure. Reduction thus came to be recognized as the only means of testing the validity of a syllogism expressed in the second, third or the fourth figure.

At the present time, however, reduction is not considered so important. It is now recognized only as one of the several forms of testing the validity of a syllogism. Other and easier forms by which the validity of a syllogism may be determined are the application to it of the general rules of syllogistic reasoning or the special canons of the figure in which the syllogism is expressed.

2. Kinds of Reduction.

There are two kinds of reduction :—(a) *Direct Reduction* and (b) *Indirect Reduction*.

(a) Direct Reduction consists in transforming a mood of the imperfect figures into the first or the perfect figure *by means of Conversion, Obversion, Contraposition or Transposition of premises.*

(b) Indirect Reduction consists in *proving with the help of the perfect figure* that the contradictory of the conclusion of a syllogism in the imperfect figure is false, and therefore, the original conclusion is true.

3. Direct Reduction : Mnemonic Verses.

The mnemonic lines were constructed partly with a view to help the process of reduction. The vowels in each word, we have seen, stand for the quality and quantity of the premises and the conclusion of a syllogism. But consonants indicate the process by which a mood in any of the imperfect figures is reduced to the perfect figure.

The mnemonic lines are—

Barbara, Celarent, Darii, Ferio ; Cesare, Camestrés,
Festino, Baroco ; Darapti, Disamis, Datisi,
Felapton, Bocardo, Ferison, Bramantip, Camenes,
Dimaris, Fesapo, Fresison.

The initial consonant of the name of any mood of imperfect figures, except Baroco and Bocardo, indicates that the mood is to be reduced to a mood of the first figure commencing with the same consonant. Thus Darapti indicates that it is to be reduced to Darü, C in Camestrés indicates that it is to be reduced to Celarent, B in Bramantip indicates that it is to be reduced to Barbara, and F in Felapton indicates that it is to be reduced to Ferio; and so on.

S, when it occurs in the middle of a name, indicates that the preceding proposition of the original syllogism is to be converted simply, but when it occurs at the end, it indicates that the conclusion of the new syllogism is to be converted simply.

P, when it occurs in the middle of a name, indicates that the preceding proposition of the original syllogism is to be converted per accidens, but when it occurs at the end, it indicates that the conclusion of the new syllogism is to be converted per accidens.

M, denotes metathesis, i.e., transposition of the original premises so that the major of the original syllogism becomes the minor of the new syllogism and the minor of the original syllogism becomes the major of the new syllogism.

K, denotes that the preceding proposition is to be obverted. Therefore, **KS** means first obvert and then convert simply; **SK** means first convert simply and then obvert. If **SK** occurs at the end, it means that the conclusion of the new syllogism is to be converted simply and then obverted.

C, indicates that the syllogism is to be reduced indirectly. The letter occurs in the moods Baroco and Bocardo. The older logicians thought that these could not be reduced directly, because they did not like to use the process of *Obversion* and *Contraposition* on account of the negative terms involved in them. But if we apply *Obversion* and *Contraposition*, we can reduce these directly: *Baroco* to *Ferio* and *Bocardo* to *Darii*. Hence the names **Faksoko** and **Doksamosk** are substituted for *Baroco* and *Bocardo*.

The letters *r*, *t*, *l*, *b*, *d*, and *n* are without any significance.

4. Direct Reduction of Imperfect Moods.

1. Moods of the Second Figure

(1) Cesare.

Celarent.

E.	No P is M.	s	No M is P.	E.
A.	All S is M.		All S is M.	A.
∴ E.	No S is P.		∴ No S is P.	E.

(2) Camestres.

Celarent.

A.	All P is M.		No M is S.	E.
E.	No S is M.		All P is M.	A.
∴ E.	No S is P.		∴ No P is S.	E.
			∴ No S is P, by Conversion.	

(3) Festino.

Ferio.

E.	No P is M.	s.	No M is P.	E.
I.	Some S is M.		Some S is M.	I.
∴ O.	Some S is not P.		∴ Some S is not P.	O.

(4) Baroco=Faksoko.

Ferio.

A.	All P is M.	ks	No not-M is P.	E.
O.	Some S is not M.	s	Some S is not-M	I.
∴ O.	Some S is not P.		∴ Some S is not P.	O.

2. Moods of the third figure.

(1) Darapti.

Darii.

A.	All M is P.		All M is P.	A.
A.	All M is S.	p	Some S is M.	I.
∴ I.	Some S is P.		∴ Some S is P.	I.

(2) Disamis

- I. Some M is P.
 A. All M is S.
 \therefore I. Some S is P.

Darîi

- All M is S. A.
 Some P is M. I.
 \therefore Some P is S. I.
 \therefore Some S is P, by
 Conversion.

(3) Datisî

- A. All M is P.
 I. Some M is S. s
 \therefore I. Some S is P.

Darîi

- All M is P. A.
 Some S is M. I.
 \therefore Some S is P. I.

(4) Felapton

- E. No M is P.
 A. All M is S. i
 \therefore O. Some S is not P.

Ferio

- No M is P. E.
 Some S is M. I.
 \therefore Some S is not P. O.

(5) Bocardo=Doksamosk

- O. Some M is not P.
 A. All M is S.
 \therefore O. Some S is not P.

Darîi

- All M is S. A.
 Some not-P is M. I.
 \therefore Some not-P is S. I.
 \therefore Some S is not-P.
 by Conversion.
 \therefore Some S is not P.
 by Obversion.

(6) Ferison

- E. No M is P.
 I. Some M is S. s
 \therefore O. Some S is not P.

Ferio

- No M is P. E.
 Some S is M. I
 \therefore Some S is not P. O.

3. Moods of the Fourth Figure.

(1) Bramantip

A. All P is M.
 A. All M is S.
 \therefore I. Some S is P.

Barbara

All M is S. A.
 All P is M. A.
 \therefore All P is S. A.
 \therefore Some S is P, by
 Conversion.

(2) Camenes

A. All P is M.
 E. No M is S.
 \therefore E. No S is P.

Celarent

No M is S. E.
 All P is M. A.
 \therefore No P is S. E.
 \therefore No S is P, by
 Conversion.

(3) Dimaris.

I. Some P is M.
 A. All M is S.
 \therefore I. Some S is P.

Darri

All M is S. A.
 Some P is M. I.
 \therefore Some P is S. I.
 \therefore Some S is P, by
 Conversion.

(4) Fesapo

E. No P is M.
 A. All M is S.
 \therefore O. Some S is not P.

Ferio

s No M is P. E.
 p Some S is M. I.
 \therefore Some S is not P. O.

(5) Fresison

E. No P is M.
 I. Some M is S.
 \therefore O. Some S is not P.

Ferio

s No M is P. E.
 s Some S is M. I.
 \therefore Some S is not P. O.

5. Indirect Reduction of Imperfect Moods

Reduction is indirect, when we prove the validity of a syllogism in an imperfect figure by showing, with the help of a syllogism in the first figure, that its contradictory is false.

The Scholastic logicians confined indirect reduction to Baroco and Bocardo, because, in their opinion these could not be reduced to the first figure directly. But the process can be applied to any of the indirect moods. Let us apply it to Cesare in the second figure:—

Fig. II	Fig. I
Cesare	Ferio
E. No P is M,	E. No P is M, (Original major) .
A. All S is M;	I. Some S is P. (Contradictory of the given conclusion).
∴ E. No S is P.	∴ O. Some S is not M. (Contradictory of the original minor premise)

If the original conclusion “No S is P” be false, its contradictory ‘Some S is P’ must be true. Taking this as the minor premise and the original major as the major premise, we frame a new syllogism in the first figure. Thus we get *Ferio* with ‘Some S is not M’ as the new conclusion.

But, we find that this new conclusion is the contradictory of ‘All S is M,’ the original minor premise, which is true by hypothesis. Therefore its contradictory, the new con-

clusion must be false. The falsity of the new conclusion must either be due to some mistake in the process of reasoning or to the falsity of one of the premises of the new syllogism. There can be no mistake in the process of reasoning, because the syllogism is in the mood *Ferio*, which is a valid mood in Fig II. One of the premises, must, therefore, be false. Now the major premise cannot be false because it is a premise in the original syllogism. Therefore, the minor premise 'Some S is P' must be false. If 'Some S is P' is false, its contradictory, 'No S is P,' that is, the original conclusion must be true.

The validity of other imperfect moods may also be proved indirectly in the same manner. But one thing should be made clear. In proving the validity of the mood *Cesare*, we took the contradictory of the original conclusion as the minor premise of the new syllogism and borrowed the major from the original. But in case of other moods we may have to take the contradictory of the original conclusion as the major premise of the new syllogism and borrow the minor from the original. The object is to form a syllogism in one of the valid moods in the first figure with the help of the contradictory of the original conclusion and one of the original premises. This is made possible by taking the contradictory of the original conclusion sometimes as the major, sometimes as the minor, and sometimes either as the major or as the minor. The following rules may, however, be laid down in this connection for our guidance :—

The *moods of the II Fig. and Camehenes* in I Fig. can be reduced indirectly by taking the contradictory of the given conclusion as the *minor premise*.

2. The *moods of the III Fig. and IV Fig. except Camenes* can be reduced indirectly by taking the contradictory of the the given conclusion as the *major premise*.

3. The moods *Fesapo* and *Fresison* may be reduced indirectly by taking the contradictory of the given conclusion *either as the major premise or as the minor premise*.

The indirect reduction of all the imperfect moods except *Cesare*, which we have already reduced, may be indicated as follows :—

Fig. II

Camestres

A. All P is M ;

E. No S is M ;

∴ E. No S is P.

Fig. II.

Festino

E. No P is M ;

I. Some S is M.

∴ O. Some S is not P.

Fig. I.

Darii

A. All P is M.

(Original major).

I. Some S is P.

(Contradictory of the original conclusion

∴ I. Some S is M.

(Contradictory of the original minor).

Fig. I.

Celarent

E. No P is M ;

(Original Major).

A. All S is P.

(Contradictory of the original conclusion).

∴ E. No S is M.

(Contradictory of the original minor).

Fig. II.

Baroco.

A. All P is M ;

O. Some S is not M :

∴ O. Some S is not P.

Fig. I.

Barbara.

A. All P is M ;

(Original major).

A. All S is P :

(Contradictory of the
original conclusion).

∴ A. All S is M.

(Contradictory of the
original minor).

Fig. III.

Darapti.

A. All M is P ;

A. All M is S ;

∴ I. Some S is P.

Fig. I.

Celarent.

E. No S is P ;

(Contradictory of the
original conclusion.)

A. All M is S ; (Original minor.

∴ E. No M is P. (*Contrary* of
the original major).

Fig. III.

Disamis.

I. Some M is P ;

A. All M is S.

∴ I. Some S is P.

Fig. I.

Celarent.

E. No S is P ;

(Contradictory of the
original conclusion.)

A. All M is S :

(Original minor).

∴ E. No M is P.

(Contradictory of the
original major.)

Fig. III.

Datisi.

A. All M is P ;

I. Some M is S :

∴ I. Some S is P.

Fig. III.

Felapton.

E. No M is P ;

A. All M is S :

∴ O. Some S is not P.

Fig. III.

Bocardo.

O. Some M is not P ;

A. All M is S ;

∴ O. Some S is not P.

Fig. I.

Ferio.

E. No S is P ;

(Contradictory of the original conclusion.)

I. Some M is S ;

(Original minor.)

∴ O. Some M is not P.

(Contradictory of the original major.)

Fig. I.

Barbara.

A. All S is P ;

(Contradictory of the original conclusion.)

A. All M is S :

(Original minor.)

∴ A. All M is P.

(Contrary of the original major.)

Fig. I.

Barbara.

A. All S is P ;

(Contradictory of the original conclusion.)

A. All M is S ;

(Original minor.)

∴ A. All M is P.

(Contradictory of the original major.)

Fig. III.

Ferison.

E. No M is P ;

I. Some M is S :

∴ O. Some S is not P.

Fig. IV.

Bramantip.

A. All P is M ;

A. All M is S :

∴ I. Some S is P.

Fig. IV.

Camenes.

A. All P is M ;

E. No M is S :

∴ E. No S is P.

Fig. I.

Darii.

A. All S is P ;

(Contradictory of the original conclusion.)

I. Some M is S :
(Original minor.)∴ I. Some M is P.
(Contradictory of the original major.)

Fig. I.

Celarent.

E. No S is P ;

(Contradictory of the original conclusion.)

A. All M is S : (Original minor.)

∴ E. No M is P.

∴ E. No P is M (Converse.) (Contrary of the original major.)

Fig. I.

Darii.A. All P is M ;
(Original major.)I. Some S is P :
(Contradictory of the original conclusion.)

∴ I. Some S is M.

∴ I. Some M is S. (Converse.) (Contradictory of the original minor.)

Fig. IV.

Dimaris.

I. Some P is M ;

A. All M is S :

∴ I. Some S is P.

Fig. IV.

(i) Fesapo.

E. No P is M ;

A. All M is S :

∴ O. Some S is not P.

Fig. IV.

(ii) Fesapo.

E. No P is M ;

A. All M is S.

Fig. I.

Celarent.

E. No S is P ;

(Contradictory of the
original conclusion.)

A. All M is S :

(Original minor.)

∴ E. No M is P.

∴ E. No P is M. (Converse.)
(Contradictory of the
original major.)

Fig. I.

Barbara.

A. All S is P ;

(Contradictory of the
original conclusion.)

A. All M is S :

(Original minor.)

∴ A. All M is P.

∴ I. Some P is M. (Converse.)
(Contradictory of the
original major.).

Fig. I.

Celarent.

E. No P is M ;

(Original major.)

A. All S is P :

(Contradictory of the
original conclusion.)

∴ O. Some S is not P.

∴ E. No S is M.

∴ E. No M is S. (Converse.)
(*Contrary* of the
original minor.)

Fig. IV.

(i) **Fresison**

E. No P is M ;

I. Some M is S ;

∴ O. Some S is not P.

Fig. I.

Darii

A. All S is P ;
(Contradictory of the
original conclusion)

I. Some M is S ;
(Original minor.)

∴ I. Some M is P.
∴ I. Some P is M. (Converse.)
(Contradictory of the
original major.)

Fig. IV.

(ii) **Fresison**

E. No P is M ;

I. Some M is S :

∴ O. Some S is not P.

Fig. I.

Celarent

E. No P is M ;
(Original major.)

A. All S is P : (Contra-
dictory of the original
conclusion.)

∴ E. No S is M.
∴ E. No M is S. (Converse.)
(Contradictory of the
original minor.)

§6. Some examples of Reduction of a mood into another mood of the same figure.

Fig. I.

(1) Barbara

A. All M is P ;

A. All S is M ;

∴ A. All S is P.

Fig. I.

Celarent

E. No M is non-P (Obverse.)

A. All S is M ;

∴ E. No S is non-P

∴ A. All S is P (Obverse.)

Fig. I.

(2) Clearent

E. No M is P ;

A. All S is M ;

∴ E. No S is P.

Fig. I.

Barbara

A. All M is non-P (Obverse.)

A. All S is M ;

∴ A. All S is non-P.

E. No S is P. (Obverse.)

Fig. I.

(3) Darii

A. All M is P ;

I. Some S is M ;

∴ I. Some S is P.

Fig. I.

Ferio

E. No M is non-P (Obverse.)

I. Some S is M ;

∴ O. Some S is not non-P.

∴ I. Some S is P. (Obverse.)

Fig. I.

(4) Ferio.

E. No M is P ,

I. Some S is M ,

∴ O. Some S is not P.

Fig. I.

Darii.

A. All M is non-P, (Obverse.)

I. Some S is M,

∴ I. Some S is non-P.

∴ O. Some S is not P.

(Obverse.)

Fig. II.

(5) **Cesare.**

E. No P is M ;

A. All S is M ;

∴ E. No S is P.

Fig. II.

(6) **Camestres.**

A. All P is M ;

E. No S is M ;

∴ E. No S is P.

Fig. III.

(7) **Darapati.**

A. All M is P ,

A. All M is S ,

∴ I. Some S is P.

Fig. III.

(8) **Felapton**

E. No M is P ;

A. All M is S :

∴ O. Some S is not P.

Fig. II.

Camestres.

A. All P is non-M ;

(Obverse).

E. No S is non-M ;

(Obverse.)

∴ E. No S is P.

Fig. II.

Cesare.

E. No P is non-M ;

(Obverse.)

A. All S is non-M ;

(Obverse.)

∴ E. No S is P.

Fig. III.

Felapton.

E. No M is non-P ,

(Obverse.)

A. All M is S ,

∴ I. Some S is not non-P.

∴ I. Some S is P. (Obverse)

Fig. III.

Darapti.

A. All M is non-P.

(Obverse.)

A. All M is S :

∴ I. Some S is non-P.

∴ Some S is not P.

(Obverse.)

EXERCISE XVII

1. What is Reduction? Is it a necessary process?
2. What are the two kinds of Reduction? Reduce *Disamis* both directly and indirectly.
3. (a) Reduce the following syllogism to the First Figure by the Direct Method :—
 All metals are elements.
 No compounds are elements.
 ∴ No Compounds are metals.
 (b) Reduce the following syllogism to the First Figure indirectly :—
 Some men are not wise.
 All men are rational.
 ∴ Some rational beings are not wise.
4. Reduce both by the Direct and Indirect Methods a concrete example of (a) *Baroco*, and (b) *Bramantip* (C.U. 1932.)
5. Give a concrete example of *Camenes* and reduce it by both the methods (C.U. 1916)
6. Construct a syllogism in *Camestres* and reduce it both by the Direct and by the Indirect methods. (C.U. 1910.)

CHAPTER XVIII

MIXED SYLLOGISM

1. Definition of mixed Syllogism.

A mixed syllogism is one in which the constituent propositions are of different relations. It has three kinds (1) Hypothetical—Categorical, (2) Disjunctive—Categorical, and (3) Dilemma.

2. Hypothetical Categorical Syllogism.

This is mixed Syllogism with a hypothetical major premise, a categorical minor, and a categorical conclusion e.g.,

If A is B, C is D ; If his guilt is proved, he will
be convicted ;

A is B ;

∴ C is D. His guilt is proved ;

∴ He will be convicted.

3. Rules of Hypothetical—categorical Syllogism.

(1) *By affirming the antecedent we can affirm the consequent.*

(2) *By denying the consequent we can deny the antecedent.*

If we affirm the antecedent of the hypothetical major premise in the minor we can affirm the consequent in the conclusion, e.g.,

If A is B, C is D ; If it rains the ground is wet ;

A is B ; It rains ;

∴ C is D. ∴ The ground is wet.

But if we affirm the consequent of the hypothetical major in the minor premise we cannot affirm its antecedent, e.g.,

If A is B, C is D ;	If it rains, the ground is wet ;
C is D ;	The ground is wet ;
∴ A is B.	∴ It has rained.

The argument is fallacious. The fallacy involved is called the fallacy of affirming the consequent.

If we deny the consequent of the hypothetical major in the minor premise, we can deny its antecedent in the conclusion e. g.,

If A is B, C is D ;	If it rains, the ground is wet ;
C is not D ;	The ground is not wet.
∴ A is not B.	∴ It has not rained.

But if we deny the antecedent of the hypothetical major premise in the minor, we cannot deny its consequent in the conclusion, e.g.,

If A is B, C is D ;	If it rains, the ground is wet.
A is not B ;	It does not rain ;
∴ C is not D .	∴ The ground is not wet.

This is invalid, and the fallacy involved is called the fallacy of denying the antecedent.

The rules of Hypothetical Syllogism may be shown to follow from its nature thus : The hypothetical major premise, which may be expressed in the form ' If A then C ' rests upon the principle of Sufficient Reason. It merely

states that A is a sufficient reason for C or that wherever A is C is. Therefore the assertion of the truth of the antecedent of a hypothetical proposition involves the truth of the consequent and the denial of the consequent involves the denial of the antecedent. But a hypothetical proposition does not state that A is the *only possible* reason or ground for C, that wherever C is A is. In other words, there is nothing in the *form* of a hypothetical proposition to suggest that the relationship between the antecedent and the consequent is reciprocal. The same consequent may result from different antecedents. Thus though it is true that when it rains the ground is wet, yet the ground may be wet from other causes. Therefore the denial of the given antecedent does not justify the denial of the consequent, nor does the assertion of the consequent justify the assertion of the given antecedent. If, however, we know from our material knowledge that the relationship between A and C in any particular case is reciprocal, that A is not only a *sufficient* cause, but the only possible cause of C, then we can infer the presence or truth of A from the presence or truth of C, and the absence or falsity of C from the absence or falsity of A.

4. Moods of Hypothetical—Categorical Syllogism.

A Hypothetical-Categorical syllogism is constructive or the **Modus Ponens**, when by affirming the antecedent of the major premise in the minor, we affirm the consequent of the major premise, in the conclusion. It is **Destructive** or in the **Modus Tollens**, when by denying the consequent of the major premise in the minor, we deny the antecedent of the major premise in the conclusion.

5. Reduction of Hypothetical—Categorical syllogism to Categorical syllogism.

A Hypothetical—Categorical Syllogism may be reduced to a Pure Categorical Syllogism by changing its hypothetical major premise into its categorical form, e.g.,

<i>Hypothetical Categorical.</i>	<i>Pure Categorical.</i>
----------------------------------	--------------------------

- | | |
|-------------------------|----------------------------------|
| (1) If A is B, C is D ; | All cases of A being B are cases |
| A is B ; | of C being D ; |
| C is D. | This is a case of A being B ; |
| | ∴ This is a case of C being D. |

- | | |
|----------------------------|--------------------------------|
| (2) If you are honest, you | All cases of your being honest |
| will be respected ; | are cases of your being |
| | respected. |

You are honest.	This is a case of your being
	honest.

∴ You are respected.	∴ This is a case of your being
	respected.

The fallacy of *affirming the consequent* in a hypothetical—categorical syllogism corresponds to the fallacy of *Undistributed Middle* in a Pure Categorical Syllogism, e.g.,

<i>Fallacy of Affirming the consequent.</i>	<i>Fallacy of Undistributed Middle.</i>
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If A is B, C is D ;	All cases of A being B are
	cases of C being D ;
C is D ;	This is a case of C being D ;
∴ A is B.	∴ This is a case of A being B.

Similarly the *fallacy of denying the antecedent* in a hypothetical categorical syllogism corresponds to the fallacy of *Illicit Major* in a Pure Categorical Syllogism, e.g.,

Fallacy of denying the antecedent.

Fallacy of Illicit Major.

If A is B, C is D ;

All cases of A being B are cases of C being D.

A is not B :

This is not a case of A being B ;

∴ C is not D.

∴ This is not a case of C being D.

6. Disjunctive-Categorical Syllogism.

This is a mixed syllogism with a disjunctive major premise, a categorical minor, and a categorical conclusion. The major premise states two alternatives, the minor premise affirms or denies one of these alternatives, while the conclusion affirms or denies the other, e.g.,

Either A is B or C is D ; Either A is B or C is D.

A is not B ;

A is B.

∴ C is not D.

∴ C is D.

7. Rules of Disjunctive-Categorical Syllogism.

We have seen that the alternatives of a disjunctive proposition may be mutually exclusive or not. (See Chap XIII. Sec. 8. (i) (3). Accordingly the following rules may be laid down for disjunctive categorical syllogism :—

(1) *If the alternatives are not mutually exclusive, we may deny one alternative and affirm the other, but not conversely.*

For example :—

(1) James is either a good student or a good sportsman ;

James is not a good student ;

∴ James is a good sportsman.

- (2) James is either a good student or a good sportsman;
 James is not a good sportsman ;
 \therefore James is a good student.

Here the alternatives are not mutually exclusive, for 'a good student' and 'good sportsman' are not contradictories, but contraries, and it is possible for one to be both a 'good student' and a 'good sportsman.' Therefore we may deny one alternative and affirm the other, but we cannot affirm one alternative and deny the other.

Thus the argument

- James is either a good student or a good sportsman ;
 James is a good student.
 \therefore James is not a good sportsman.

is incorrect. It may be said to involve the fallacy of *Affirming an Alternative*. •

(2) *If the alternatives are mutually exclusive we may deny one alternative and affirm the other, and conversely.*

For example,

- (1) James is either honest or dishonest.
 James is not honest.
 \therefore James is dishonest.
- (2) James is either honest or dishonest.
 James is not dishonest.
 \therefore James is honest.
- (3) James is either honest or dishonest.
 James is honest ;
 \therefore James is not dishonest.

(4) James is either honest or dishonest.

James is dishonest;

∴ James is not honest.

Here, the alternatives are mutually exclusive, for 'honest' and 'dishonest' are contradictories; a man cannot be both 'honest' and 'dishonest.' Therefore we may deny one alternative and affirm the other or affirm one alternative and deny the other.

A disjunctive categorical syllogism of which the minor premise denies one alternative of the disjunctive major and the conclusion affirms the other is said to be in *modus tollendo ponens*; while a disjunctive categorical syllogism of which the minor premise affirms one alternative and the conclusion denies the other is said to be in *modus ponendo tollens*.

It should be noted that the major premise of a disjunctive categorical syllogism may consist of more than two alternatives, in which case the conclusion is disjunctive unless all the alternatives except one are denied in the minor premise.

8. Dilemma.

A dilemma is a mixed syllogism in which from a compound hypothetical major premise and a disjunctive minor, the alternatives of which either affirm the antecedents or deny the consequents of the major, a conclusion is drawn which is either categorical or disjunctive, e.g.,

(1) If A is B, C is D and if E is F, C is D.

Either A is B or E is F.

∴ C is D.

(2) If you act justly, men will hate you, and if you act unjustly gods will hate you.

Either you act justly or you act unjustly.

∴ Either men will hate you or gods will hate you.

The dilemma is practically speaking a *double hypothetical-categorical syllogism*. In a simple hypothetical-categorical syllogism the major premise is hypothetical and the minor premise either affirms the antecedent or denies the consequent in order that the conclusion may, in the former case, affirm the consequent or, in the latter case, deny the antecedent. In a dilemma the major premise is a compound hypothetical i.e., a combination of two hypothetical propositions, and the minor is disjunctive of which the two alternatives either affirm the antecedents or deny the consequents of the major, in order that the conclusion may, in the former case, affirm the consequent or consequents or, in the latter case, deny the antecedent or antecedents. The word 'dilemma' ordinarily implies a situation in which there are only two alternative courses of action either of which is attended with unpleasant consequences. That there are only two alternative courses is stated in the second premise of the dilemma and the fact that either of these alternatives is attended with unpleasant circumstances is stated in the first premise. This is the usual order in which the dilemma is stated, but there does not seem to be any reason why it may not be stated in the reverse order.

9. Forms of Dilemma

A dilemma may be either Constructive or Destructive. It is **Constructive** if the minor premise alternatively affirms the antecedents of the major ; it is **Destructive** if the minor premise alternatively denies the consequents of the major.

Both constructive and Destructive dilemmas may be either Simple or Complex. A dilemma is **Simple**, if its conclusion is a categorical proposition; it is **Complex**, if the conclusion is a disjunctive proposition. Thus there are four forms of Dilemma—(1) *Simple Constructive*, (2) *Complex Constructive*; (3) *Simple Destructive*, and (4) *Complex Destructive*.

Examples:—

(1) *Simple Constructive Dilemma.*

(a) If A is B, C is D and if E is F, C is D;

Either A is B or E is F;

∴ C is D.

(b) If a man acts in accordance with his own judgment, he will be criticised; and if he acts according to the advice of others, he will be criticised.

But he must either act according to his own judgment or according to the advice of others.

Therefore, in any case, he will be criticised.

(2) *Complex Constructive Dilemma.*

(a) If A is B, C is D and if E is F, G is H;

Either A is B or E is F;

∴ Either C is D or G is H.

(b) If you stay at home you will remain ignorant and if you go to school you will become a pedant.

But you must either stay at home or you must go to school.

∴ You must either remain ignorant or become a pedant.

(3) *Simple Destructive Dilemma.*

(a) If A is B, C is D and if A is B, E is F;

Either C is not D or E is not F;

∴ A is not B.

(b) "If a thing moves, it must move either in the place where it is or in the place where it is not ;

But it cannot move where it is, nor it can move where it is not ;

Therefore, it cannot move" (Creighton.)

(4) *Complex Destructive.*

(a) If A is B, C is D and if E is F, G is H ;

Either C is not D or G is not H ;

∴ Either A is not B or E is not F.

(b) If a man is dutiful, he will obey orders ; and if he is intelligent he will understand them.

But either he does not obey orders or he does not understand them.

∴ Either he is not dutiful or he is not intelligent.

10. Formal Rules of the Dilemma

We have seen that the dilemma is a combination of two hypothetical-categorical syllogisms. The formal rules of the dilemma are, therefore, the same as those of hypothetical categorical syllogism. They may be stated as follows :—

(1) By affirming the antecedents of the compound hypothetical major in the minor premise, we may affirm the consequents in the conclusion, but not conversely.

(2) By denying the consequents of the compound hypothetical major in the minor premise, we may deny the antecedents in the conclusion but not conversely.

To test the formal correctness of a dilemma we may analyse it into two hypothetical—categorical syllogisms and see whether the rules of the latter have been observed

For example, let us take the following Simple Constructive Dilemma :

If A is B, C is D and if E is F, C is D.

Either A is B or E is F.

∴ C is D.

It may be analysed into the following two hypothetical categorical syllogisms :—

(1) If A is B, C is D. (2) If E is F, C is D.

A is B

E is F.

∴ C is D

∴ C is D.

We find that in both the antecedents have been affirmed in the minor and the consequent have been affirmed in the conclusion. Hence the dilemma is formally correct.

11. The Material Conditions of the Dilemma.

A dilemma is very often formally correct but materially incorrect. The following are the conditions of the material validity of the dilemma :—

(1) *In the major premise the consequents must follow from the antecedents*, i.e., there must be a necessary connection between them. If this is not so the major premise is false and the dilemma is materially incorrect. This way of proving the material falsity of the dilemma is called *breaking the porus of the dilemma* or *"taking the dilemma by the porus"*. The two alternatives given in the disjunctive minor premise of a dilemma are known as its *porus*, since the dilemma is compared to a bull run out of control and the person who is faced with the dilemma is like the person faced with the bull and impaled on one other of his two horns. If it is shown that the *alte*

do not necessarily lead to the consequences stated in the major premise, it becomes apparent that the horns are loosely fixed and therefore harmless. It may be that both the parts of the compound hypothetical major premise are false, i.e., the consequent does not follow from the antecedent in either case, but even if one part of the major premise be false the dilemma must be materially false.

In the example of Simple Constructive Dilemma given in Sec. 8 both the parts of the compound hypothetical major premise are false there being no good reason to suppose why a man should be criticised just because he acts according to his own judgment or according to the advice of others. In the former case he may be justified if his own judgment is better than that of others, and in the latter he may be justified if he finds that the judgment of the other people is better than his.

(2) *In the minor premise the alternatives must be mutually exclusive*, i.e., there should be real opposition between the two alternatives and there should be no possibility of a middle course or a third alternative. If it can be shown that the alternatives are not mutually exclusive, the minor premise is materially false, and the conclusion must also be materially false. This way of proving the material falsity of a dilemma is called "escaping between the horns of a dilemma."

In the example of the Simple Constructive dilemma criticised above the alternatives, stated in the minor premise, 'He must act according to his own judgment or according to the judgment of others,' are not mutually exclusive, for a man's own judgment need not necessarily be opposed to the judgment of others. Thus we may escape between the horns of the dilemma.

12. Rebutting a dilemma.

To rebut a dilemma is to present an equally cogent counter-dilemma, proving the opposite conclusion. *In rebutting the consequents of the major premise of the original argument change places and their quality is also changed.* Thus

If A is B, C is D and if E is F, G is H.

Either A is B or E is F,

∴ Either C is D or G is H,

may be rebutted by the dilemma.

If A is B, G is not H, and if E is F, C is not D,

Either A is B or E is F.

∴ Either G is not H or C is not D.

It will, however, be noted that the conclusion is only apparently opposed to the original one. For in both cases C is D and G is not H (or G is H and C is not D) may be true together. Rebuttal does not conclusively prove the invalidity of the original dilemma. It only lays bare its weakness. The opponent offers a counter-dilemma, which is equally effective and says 'If you are right, I am also right; if I am wrong, so are you; your position is no better than mine.' This will be clear from the following concrete example of dilemma, which have been rebutted:—

(1) The Athenian mother, trying to prevent her son from entering public life, argued thus:—

'If you say what is just men will hate you; and if you say what is unjust the gods will hate you.

But you must either say what is just or what is unjust.

Therefore, you will be hated.

The son replied:—

"If I say what is just, the gods will love me; and if I say what is unjust, men will love me.

But I must either say what is just or what is unjust.

Therefore, I shall be loved."

(2) Protagoras agreed to train Enathlus as a lawyer on condition that he paid half of the fee at once and the other half when he won the first case. But Enathlus engaged in no suit after his training was completed. Protagoras, therefore, sued him, and confronted him with the following dilemma :—

“Most foolish young man, if you lose this suit, you must pay me by order of the court, and if you gain it you must pay me by our contract.

You must either lose or gain.

Therefore in either case you must pay me.”

Enathlus rebutted the dilemma thus :—

“Most sapient master, if I lose this suit I am free from payment by our contract, and if I gain it, I am freed by the judgment of the court.

But either I lose or I gain.

Therefore, in either case I shall not pay you.

(3) If emigrants are useless, they are a burden to the colonies ; if they are useful, they are a loss to the mother country ;

But they are either useless or useful ;

Therefore emigration is either a burden to the colonies or a loss to the mother country.

The dilemma may be rebutted thus :—

If emigrants are useless they are no loss to the mother country, if they are useful they are no burden to the colonies.

But they are either useless or useful.

Therefore, emigration is either no loss to the mother country or no burden to the colonies.

In these examples, the conclusions of the original and the rebutting dilemma are not really incompatible. They appear to be so because they are incomplete. Thus, in the first example, both love and hatred follow from either of the two alternatives, hatred of the gods and love of men in one case and the love of god and hatred of men in the other. But only hatred has been mentioned in one

conclusion and love in the other. Thus both the dilemmas are equally defective. But the value of the rebutting dilemma, lies in the fact that it is sufficiently plausible to show up the weakness of the opponent's position.

It should, however, be noted that *only the complex Constructive dilemmas can be thus rebutted*, and only those in which there is some flaw, though it is true that dilemmatic arguments are seldom flawless.

It is not for any theoretical reason that the rebuttal of *complex destructive dilemmas* is regarded as an impossibility.

Theoretically it is possible to rebut a complex destructive dilemma by *denying the antecedents and transposing the consequents* of the original major. Thus the dilemma :—

If P then R, and if Q then S ;

But either not R or not S ;

Therefore, either not P or not Q ;

may be rebutted by :—

If not P then S, and if not Q then R.

But neither not S or not R.

Therefore, either P or Q.

But, practically, it is not possible to combine the negative of each original antecedent with the other original consequent with any show of plausibility. Hence it is not possible to rebut a complex destructive dilemma, unless, of course, it is reduced the constructive form. Thus may be made clear by attempting to rebut the concrete example of a complex destructive dilemma, given in section 9 above. Rebutted it will stand thus :—

If a man is not dutiful, he will understand the orders, if he is not intelligent, he will obey the orders.

But either he does not understand the orders or he does not obey them ;

Therefore, either he is dutiful or he is intelligent.

It is obvious that the consequents do not follow from the antecedents with a reasonable amount of plausibility.

Simple dilemmas cannot be rebutted at all, because in their case there can be no transposition of antecedents and consequents.

13. Exercises Worked Out

Test the following arguments :—

(1) *The cat must be away, since the mice are playing about, for when the cat is away the mice must play.* (U. P. B, I.E. 1933).

Logical form :

If the cat is away the mice must play

The mice are playing about.

∴ The cat must be away.

This is a hypothetical categorical syllogism in the Modus Ponens. The minor premise, here affirms the consequent. Hence it involves the fallacy of *Affirming the consequent*

(2) *Logic is indeed worthy of being cultivated, if Aristotle is to be regarded as infallible ; but he is not infallible ; therefore logic is not worthy of being cultivated.*

Logical form :—

If Aristotle is to be regarded as infallible. Logic is indeed not worthy of being cultivated.

But Aristotle is not to be regarded as infallible.

∴ Logic is not worthy of being cultivated.

This is a hypothetical—categorical syllogism, involving the fallacy of *denying the antecedent*.

(3) *If all the accused were innocent, some at least would have been acquitted ; we may infer then that some were innocent, since none have been acquitted.* (C. U. 1931).

Logical Form.

If all the accused were innocent, some at least would have been acquitted ;

But none have been acquitted ;

∴ Some of the accused are not innocent (O). (True)

∴ None of the accused are innocent. (E) (Doubtful)

This is a Hypothetical—Categorical Syllogism in the *Modus Tollens*. Here we have denied the antecedent of the major premise in the conclusion by denying its consequent in the minor. Since the antecedent is an A proposition the correct conclusion would be its logical contradictory i.e., an O proposition. But the conclusion here drawn is an E proposition, which, according to the rule of *sub-alternation* is doubtful, when O is true. Therefore the argument is invalid.

(4) A student who tops in the I. C. S. examination must be either very industrious or very intelligent. The student who topped in the I. C. S. examination last year cannot be very industrious because he is very intelligent.

Logical Form :

Either a student who tops in the I. C. S. examination is very industrious or he is very intelligent.

The student who topped in the I. C. S. examination last year is very intelligent.

∴ The student who topped in the I. C. S. examination last year is not very intelligent.

This is a disjunctive-categorical syllogism. The alternatives are not mutually exclusive, so that by denying one alternative we can affirm the other, but by affirming one alternative we cannot deny the other. But the minor pre-

mise affirms one alternative and the conclusion denies the other. Hence the argument is fallacious.

(5) If a pupil is found of learning, he needs no stimulus, and if he dislikes learning, no stimulus will be of any avail; but as he is either found of learning or dislikes it, as stimulus is either needless or of no avails.

Logical form :—

If a pupil is fond of learning, he needs no stimulus, and if a pupil dislikes learning, no stimulus will be of any avail; But he is either fond of learning or he dislikes it.

∴ Either he needs no stimulus or no stimulus will avail.

This is a complex constructive Dilemma. It is formally correct but materially wrong. We can *take it by the horns*, for the consequents are not causally connected with the antecedents. If a pupil is fond of learning a stimulus may still be needed to augment his interest; and if he dislikes it a stimulus may serve to produce interest in him. We can also *escape between the horns* of the dilemma by showing that the alternatives mentioned in the minor premise are not exhaustive. It is possible that a pupil may neither like nor dislike learning and that he may just be indifferent to it, in which case also a stimulus may be useful. The weakness of the argument may be shown more effectively by rebutting it as follows :—

If a pupil is fond of learning, a stimulus will be useful (to augment his interest); if he dislikes learning a stimulus will be needed (to create interest).

But he is either fond of learning or he dislikes it.

∴ Either a stimulus is useful (to augment interest) or it is needed (to create interest).

(6) If I marry, I shall be unhappy, because I will have to take care of my wife ; if I do not marry I shall be unhappy, because I will not have a wife to take care of me.

Logical form :

If I marry I shall have to take care of my wife ; if I do not marry, I shall not have a wife to take care of me.

But I must either marry or not marry.

∴ Either I shall have to take care of my wife or I shall not have a wife to take care of me, i.e., in either case I shall be unhappy.

This is a Complex Constructive Dilemma. It is formally correct but materially false. The falsity is due to the major premise in which the consequents have not been completely stated. The complete consequent of the first alternative is 'I shall have to take care of my wife and she will take care of me' ; similarly the complete consequent of the second alternative is 'I shall not have a wife to take care of me, and shall myself be saved the trouble by taking care of 'her'. The dilemma may be rebutted as follows :—

If you marry, you will have a wife to take care of you ; if you do not marry you will not have a wife to be taken care of by you.

But you must either marry or not marry.

∴ Either you will have a wife to take care of you, or you will not have a wife to be taken care of by you, i.e., either case you will be happy.

EXERCISE XVIII

A

(Mixed Hypothetical Syllogism)

1. What do you understand by a Mixed Hypothetical or Hypothetical Categorical Syllogism? Distinguish between a Constructive and a Destructive Hypothetical Syllogism, giving concrete examples and explain the rules of inference. (D. U. 1939).

2. Explain and justify the principle on which the hypothetical syllogisms proceeds. Taking a concrete example show what fallacy is involved in the denial of the antecedent. Is there any form of hypothetical syllogism in which the denial of the antecedent yields a valid conclusion? (U.P.B., I.E. 1935).

3. Enunciate the canon of the Conditional Reasoning (Hypothetical—Categorical Syllogism), and show by examples that the violation of this canon leads to the fallacy of either illicit major or undistributed middle. (U.P.B., 1933). (C. U. 1927).

4. Explain the nature of conditional propositions. What principle of thought is specially involved in them? Take the proposition. If S is P, Q is R, as major premise: supply the possible categorical minors, and show which of them lead to valid conclusions.

5. Reduce the following arguments into their logical forms, of Hypothetical and Categorical Syllogisms, and test their validity in each form separately:—

(a) This student must be diligent because he has passed the examination.

(b) If a person is guilty he is punished. But he is not guilty. So he will not be punished.

6. Test the following arguments:—

(a) If virtue is voluntary, vice is voluntary, and we know that virtue is voluntary; therefore vice must be voluntary.

(b) If men have free will, they are responsible for their action but they have no free will.

(c) If all men were honest, laws would be unnecessary; but since laws are necessary it follows that no men are honest.

(C. U. 1

(d) The standard of the Calcutta University must be low, since the percentage of success at its examinations is comparatively high; and it is a well-known fact that the percentage of success is high when the standard is low (C. U. 1920).

(e) If a man is tyrant, he deserves to die. Caesar was not a tyrant and, therefore, did not deserve to die.

(f) 'If the charge is false, the author of it is either ignorant or malicious. But the charge is true. Therefore he is neither'—(*Stock*)

(g) If the study of Logic furnished the minds a multitude of useful facts like other sciences; it would deserve to be cultivated; but it does not furnish the mind with a multitude of useful facts, therefore, it does not deserve cultivation. (*Jerons*).

(h) 'Whenever a syllogism is valid, it has not more than three terms; therefore, this syllogism, which has not more than three terms is valid'—(*Mellone*).

(i) 'If all men were capable of perfection, some would have attained it; but none having done so, none are capable of it'—(*Mellone*).

B

(*Mixed Disjunctive Syllogism*)

(7) Explain the nature of a Disjunctive (=Disjunctive—Categorical) Syllogism (C. U. 1913). Exhibit the different forms of Disjunctive Syllogism, giving their rules and reasons for them. (C. U. 1913).

(8) What is meant by a Disjunctive Proposition? Are the alternatives in such a proposition mutually exclusive or not? Discuss the question and show that the analysis of a disjunctive syllogism depends upon the answer to this question.—(U.P.B. 1929).

(9) State the canon of Disjunctive Syllogism.—Take the proposition "A student who fails is either lazy or stupid" (as a major premise). Supply the different possible minor premises and show which of them lead to valid conclusions, giving reasons. (U.P.B. 1936).

(10) Test the following arguments:—

(a) Diplomatist is either not honest or not successful. Bismark was successful; therefore he was not honest. (*Josephb*).

(b) Either the in crests of religion require the maintenance of the temporal power, or the popes are actuated by worldly motives in continuing to claim it; the interests of religion do require it; therefore, the popes are not so actuated.

(Joseph).

(c) 'Leibnitz did not invent the calculus for it is certain that Newton invented it and either Newton or Leibnitz invented the calculus.'

(d) A material body is either solid, fluid or gaseous. It is gaseous. Therefore it is neither solid nor fluid.

(The alternatives here are not exclusive, for fluid includes gaseous).

(e) The students of this college either play foot ball or basket-ball, The Second Year Arts students play football. Therefore, they do not play basket-ball.

C

(Dilemma)

(f) Define a Dilemma and give instances of the various kinds of Dilemmas. What are the weak points in a Dilemma? (U.P.B. 1932).

(10) Define Dilemma, construct a complex Constructive Dilemma to prove that 'Examinations are useless' and rebut it. (U.P.B. 1934)

(11) What are the essential characteristics of a Dilemma? Give an example each of the constructive and Destructive types of Dilemma. How is a Dilemma refuted? (P.U. 1926).

(12) 'Dilemmatic arguments are more often fallacious than not.' Explain and illustrate the statement (C. U. 1915).

(13) Test the following arguments:—

(a) A land army is unnecessary to an island country, for if its navy holds the sea, there is nothing for the navy to do and if its navy is driven from the sea, there is nothing that its army can do (to save the country from starvation. (C. U. 1912.)

(b) If he is sensible to shame, he ought not to be scolded and if he is not, he won't mind it.

(c) An escort is unnecessary, for if you are well received, it would be needless and if not well received it would raise suspicions.

(d) Why should we fret about happenings that are not to our taste? If we can help them, we should manfully fight against them, if we cannot fight them, we should cheerfully endure them. (U.P.B. 1930).

(e) If the train is late ; I cannot reach Allahabad in time for the meeting of the Intermediate Board ; if it is not late, I cannot catch the train. But the train will be either late or not late. Therefore in any case I cannot attend the meeting of the Board. (U.P.B. 1931).

(f) The people of India should not launch any movement for the freedom of their country, for if the movement is successful, there will be a civil war in the country, but if it is not successful, all their sufferings will be in vain.

(g) Armament is a necessity. In peace time it is necessary to prevent war ; in war time it is necessary to win the war.

(h) Punishment is of no avail, the good do not need to be punished, and no amount of punishment will correct the wicked (U.P.B. 1936).

(i) If they stay abroad, the wife will die ; if they stay within the country the climate will prove fatal to the husband. It is, therefore, feared that one of them must fall a victim.

He is a boy,	(Minor—Pr. given)
∴ He is mischievous	(Conclusion—suppressed).

It is not necessary that an enthymeme should be categorical. It may be the abridged statement of a mixed syllogism. Thus, 'The farmers must be happy, because the crop is good' is such an enthymeme. It may be expanded into the following syllogism:—

If the crop is good, the farmers are happy,
The crop is good,
∴ The farmers are happy.

Similarly an anthymeme may be the abridged statement of a pure hypothetical or of a pure disjunctive syllogism.

3. How to determine the order of an Enthymeme.

The order of an enthymeme of the third or fourth order may be easily recognised. Whether an enthymeme belongs to the first or second order may be found out by comparing the terms of the conclusion with those of the given premise. If the given premise contains the subject of the conclusion, the suppressed premise must contain the predicate of the conclusion. It is, therefore, the major premise and the enthymeme is of the first order. If the given premise contains the predicate of the conclusion, the suppressed premise must contain the subject of the conclusion. It is, therefore, the minor premise and the enthymeme is of the second order.

4. How to supply the suppressed premise of an Enthymeme.

When an enthymeme is of the first or second order we complete the syllogism by supplying the major premise or the minor. To get the major premise we combine the middle term with the predicate of the conclusion; to get

the minor we combine the middle term with the subject of the conclusion. The quality and the quantity of the proposition to be supplied depends in either case on the quality and quantity of the given propositions. Take, for example, the enthymeme—'No S is P, because all S is M.' The conclusion here is a universal negative proposition; therefore both the premises must be universal and one must be negative. Since the minor premise is universal affirmative the suppressed major premise must be universal negative. To get the required premise, therefore, we must combine the middle term with the predicate of the conclusion in a universal negative proposition. Thus the proposition to be supplied is either 'No M is P' or 'No P is M.'

5. How to draw a conclusion from a given combination of premises.

When required to draw a conclusion from any two premises first see if the given premises are in a valid mood in any of the four figures. If so draw the conclusion which follows from them in accordance with that mood. Since the conclusion is not given and the major and minor terms are not known any one of the two premises may be taken as major and the other as minor. Sometimes, however, the combination of the given propositions is such that it does not at the first sight seem to justify any conclusion, but a conclusion may be drawn by slightly modifying the propositions by some forms of immediate inference. For example, the following premises are not in any valid mood :—

All B is A,
No C is not—B.

But by obverting the second premise we get the following syllogism in Barbara :—

All B is A
All C is B
∴ All C is A

6. How to find premises for a given conclusion.

To form a syllogism with a given conclusion we should always prefer the first figure. The quality and quantity of the conclusion indicate the mood of the required syllogism. We have only to find out a middle term which may be combined with the predicate of the conclusion to give the particular major premis required by the mood and with the subject of the conclusion to give the particular minor premis required by it.

Examples: To find premises for the conclusion 'No kings are all-mighty.' Here the conclusion is an E proposition, which indicates that the required syllogism must be in the mood *Celarent*, i. e., the major premis must be E and the minor A. The major term is 'all-mighty' and the minor term is 'kings.' 'Men' may serve as the middle term. Combining 'men' with 'all-mighty' in an E proposition we get the major premis. 'No men are all-mighty', combining 'men' with 'kings' in an A proposition we get 'All kings are men,' Thus we get the syllogism—

No men are all-mighty,
All kings are men,
∴ No kings are all-mighty.

7. Examples Worked Out.

1. Examine the following arguments:—

(a) This poor child's life is precious, because human life is precious;

The above is an enthymeme of the first order. When fully expressed it stands thus :

All human life is precious,
This poor child's life is human life,
∴ This poor child's life is precious.

The reasoning is valid being Barbara, in the first figure.

(b) Only material bodies gravitate, and light does not gravitate.

This is an enthymeme of the third order. When fully expressed it stands thus :

All gravitating bodies are material ;
 Light is not a gravitating body ;
 \therefore Light is not material.

This is invalid, as it involves the fallacy of Illicit Major.

(c) James is upright, for only strict men are so.

This is an enthymeme of the second order. Fully expressed it stands thus :

All who are upright are strict ;
 James is strict ;
 \therefore James is upright.

This argument is not valid. It involves the fallacy of undistributed middle, because the middle term 'strict' stands as the predicate in both the propositions which being affirmative cannot distribute their predicate.

(d) He must be a Sikh, for no Sikh shaves his beard.

This is an enthymeme of the second order. Fully expressed it assumes the following form :—

No Sikh shaves his beard ;
 He does not shave his beard ;
 \therefore He is a Sikh.

This is invalid, since it involves the fallacy of negative premises.

(e) I do not derive my opinion from the newspapers for I never read any of them.

This is an enthymeme of the first order. It may be fully expressed thus :

All persons who derive their opinion from
newspapers are persons who read them ;

I am not a person who reads newspapers ;

∴ I am not a person who derives his opinion from them.
This is valid, being Camestres in the second figure.

(f) The sky being cloudy the day is sultry. (C. U. 1911)

This is a mixed hypothetical—categorical syllogism stated enthymatically. When fully expressed it stands thus:

If the sky is cloudy, the day is sultry ;

The sky is cloudy ;

∴ The day is sultry.

It is valid because the minor premise affirms the antecedent and the conclusion affirms the consequent.

(g) All grasses have parallel-veined leaves, and so has the bamboo (C. U. 1912).

This is an enthymeme of the third order. It may be expanded into a syllogism thus :

All grasses are plants which have parallel-veined
leaves ;

All bamboos are plants which have parallel-veined
leaves ;

∴ All bamboos are grasses.

It is invalid. It involves the fallacy of Undistributed Middle.

(h) This news is too good to be true.

The statement means that the news is not likely to be true, because it is very good. Taken in the form it is an

enthymeme of the first order. It may be sylogistically stated thus :

No very good news is likely to be true.

This is a very good news.

∴ This news is not likely to be true.

This is valid, being Celarent in the first figure.

(i) He must be in Calcutta, for he is not in Bombay.

This is a disjunctive—categorical syllogism stated enthymatically. It is an enthymeme of the first order. It may be completed thus :

He must be either in Calcutta or in Bombay.

He is not in Bombay.

∴ He is in Calcutta.

The argument is valid.

2. Supply premises to the following :—

(1) Some educated persons are not good reasoners.

(2) All fixed stars obey the law of gravitation.

(1) As the conclusion is an O proposition, the syllogism which proves it may be Ferio in the first figure and the suppressed premises may be—(1) 'No persons having narrow views are good reasoners' and (2) 'Some educated persons are persons having narrow view.'

[The premises may also be supplied in accordance with the moods Festino, Ferison, and Fresison in the second, third and fourth figures. One way of doing this is by reducing the syllogism in Ferio into each of these figures directly].

- (2) The conclusion here is an A proposition. The syllogism must, therefore, be in the mood Barbara. 'Heavenly bodies' may serve as a middle term, and we may supply the following premises :—
- (1) all heavenly bodies obey the law of gravitation,
 - (2) All fixed stars are heavenly bodies.

EXERCISE XIX

1. What do you understand by the Enthymeme? Exhibit the different classes into which each of these may be divided and give a concrete example of each of the classes. (C.U. 1912).

2. Reduce the following arguments to their logical form and examine their correctness :—

- (1) The people of England are wealthy, because they are industrious.
- (2) The world cannot be eternal, because it is not perfect.
- (3) All novelty is injury, for it defaces the present state of things.
- (4) The colouring substance cannot be blood; it is soluble in benzol.
- (5) He has broken his word, which no honest man ever does. *
- (6) As industrious men are successful, James must be industrious.
- (7) Iron is a metal because it conducts heat and electricity.
- (8) Gold is a noble metal because it does not rust.
- (9) He is not happy, for he is envious.
- (10) He is evidently pious, for he regularly says his prayers.
- (11) He is too honest to be worldly successful.
- (12) Dawson was not penniless, therefore he was not bribed.
- (13) Air is material because it has weight.
- (14) Air is a gas because it is not liquid or solid.
- (15) Blessed are the pure in heart, for they shall see God.
- (16) No fixed stars are planets, and all planets are round bodies.
- (17) All peers are legislators, and some peers are men of inferior ability.
- (18) All reindeer have four stomachs, and no carnivorous animals have four stomachs.
- (19) These merit own respect for they are honest men.
- (20) This idea is real because it agrees with the external thing.

CHAPTER XX

TRAINS OF REASONING

1. Train of Reasoning or Polysyllogism.

A Train of Reasoning or Polysyllogism is a combination of two or more syllogisms so linked together as to lead to a single conclusion.

In such a train of reasoning the conclusion of one syllogism forms a premise in another. For examples :—

Formal Example

- (1) All A is B (minor)
All B is C (major)
∴ All A is C (conclusion)
- (2) All A is C (minor)
All C is D (major)
∴ All A is D (conclusion)
- (3) All A is D (minor)
All D is E (major)
∴ All A is E (conclusion)

Here the conclusion of (1) forms a premise in (2) and the conclusion of (2) forms a premise in (3) and all the syllogisms lead to the single conclusion 'All A is E.'

In a train of reasoning a syllogism, whose conclusion forms a premise in another is called **Prosyllogism**; while

a syllogism which has for one of its premises the conclusion of another is called an **Episyllogism**. The same syllogism may be a prosyllogism in relation to one and episyllogism in relation to another. Thus in the above train of reasoning the second syllogism is a prosyllogism in relation to the third and an episyllogism in relation to the first.

The progress of thought in a train of reasoning may be from prosyllogism to episyllogism or from episyllogism to prosyllogism. *When the train of reasoning passes from prosyllogism to episyllogism i.e., from certain premises to the conclusion that follows from it, it is called **Progressive, Episyllogistic or Synthetic**, but when it passes from episyllogism to prosyllogism, i.e., from a conclusion to the premises which prove it, it is called **Regressive Prosyllogistic or Analytic**.* The train of reasoning given above is progressive because it proceeds from prosyllogism to episyllogism. The first syllogism is a prosyllogism in relation to the second and the second a prosyllogism in relation to the third. The following will illustrate a regressive train of reasoning:—

- (1) All A is E (conclusion)
 \therefore All D is E, and (major)
 All A is D (minor)
- (2) All A is D (conclusion)
 \therefore All C is D, and (Major)
 All A is C (Minor)
- (3) All A is C (Conclusion)
 \therefore All B is C, and (Major)
 All A is B (Minor)

Here the reasoning proceeds from episyllogism to prosyllogism. The first syllogism is an episyllogism in relation to the second and the second is an episyllogism in relation to the third.

Progressive train of reasoning is the natural form our reasoning adopts when being in possession of certain general principles we deduce the conclusions which necessarily follow from them. Regressive train of reasoning is the natural form it adopts when the conclusion is given first and we pass back by successive steps of proof to the premises or truths of higher and higher generally on which it may be based. The former suits the purpose of Deductive sciences, such as Geometry, while the latter suits the purpose of inductive sciences, such as Physics.

2. Sorieties

The sorieties is a progressive polysyllogism with the intermediate conclusions (and the corresponding premises of the episyllogisms) suppressed. It is thus an *abridged polysyllogism* or a *chain of enthymemes*. It has either of these two typical forms.

First Form

All A is B.

All B is C.

All C is D.

All D is E

∴ All A is E.

Second Form

All D is E.

All C is D.

All B is C.

All A is B.

∴ All A is E.

To indicate the propositions that are suppressed in these sorities we may analyse them into their constituent syllogisms thus :

First Form

(1) **All B is C** .. (Major)
All A is B.. (Minor)
 \therefore *All A is C* .. Conclusion

(2) **All C is D**.. (Major)
All A is C .. (Minor)
 \therefore *All A is D* .. Conclusion

(3) **All D is E**.. (Major)
All A is D .. (Minor)
 \therefore **All A is E**.. Conclusion

Second Form

(1) **All D is E**.. (Major)
All C is D.. (Minor)
 \therefore *All C is E* .. (Conclusion)

(2) *All C is E* .. (Major)
All B is C.. (Minor)
 \therefore *All B is E* .. (Conclusion)

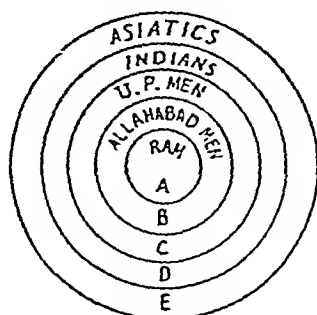
(3) *All B is E* .. (Major)
All A is B.. (Minor)
 \therefore *All A is E* .. (Conclusion)

The first form is now known as Aristotelian and the second as Goclenian (after Rudolf Goclenius, who first called attention to it). **Aristotelian Sorities** may be defined as a chain of propositions in which the predicate of each becomes the subject of the next and in the conclusion the last predicate is predicated of the first subject. **Goclenian Sorities** may be defined as a chain of propositions in which the subject of each proposition becomes the predicate of the next and in the conclusion the first predicate is predicated of the last subject.

In both forms of sorities the premises and the conclusion are the same, but they differ in the following respects :

(a) In the Aristotelian form the reasoning progresses from terms of lower extent to those of wider extent, while

in the Goclenian the case is just the reverse. This may be illustrated by means of the following diagram:—



It is apparent from the diagram that in the Aristotelian form we work from within outwards, in the Goclenian from without inwards.

(b) In the Aristotelian form the subject of the conclusion is the subject of the first premise and the predicate of the conclusion is the predicate of the last premise; while in the Goclenian form the subject of the conclusion is the subject of the last premise and the predicate of the conclusion the predicate of the first premise.

(c) In the *Aristotelian* form the *suppressed conclusion* of a prosyllogism is the *suppressed minor* premise of the corresponding episyllogism, while in the *Goclenian*, the *suppressed conclusion* of a prosyllogism is the *suppressed major* premise of the corresponding episyllogism.

(d) In the *Aristotelian* sorities the *minor* premise of every syllogism, save the first, is suppressed; while in the *Goclenian* the *major* premise of every syllogism, save the first, is suppressed. That is, in the *Aristotelian* form the first premise is *minor* and the remaining ones are *major*; in the *Goclenian*, the first premise is *major* and the remaining ones are *minor*.

3. Regular and Irregular Sorities.

Sorities may be either regular or irregular. It is regular when the middle terms maintain a fixed relative position, so that if the middle term is subject in one proposition, it is always the predicate in the other, and vice versa. It is irregular when the middle term does not have a fixed relative position.

Syllogisms composing a regular sorities are always in the first figure. In the irregular sorities the syllogisms are in different figures.

The examples of sorities given above are all in the regular form.

4. Rules for the Regular Sorities.

The following rules may be laid down for regular sorities :—

(1) *Only one premise can be negative, namely the last in the Aristotelian form and the first in the Goclenian.*

(2) *Only one premise can be particular, namely, the first in the Aristotelian form and the last in the Goclenian.*

The following are the concrete examples of the two kinds of sorities, resolved each into its component syllogisms :

First Form

Ram is an Allahabad man.

Allahabad men are U.P. men.

All U.P. men are Indians.

All Indians are Asiatics.

∴ Ram is an Asiatic.

Second Form

All Indians are Asiatics.

All U.P. men are Indians.

All Allahabad men are U.P. men.

Ram is an Allahabad man.

∴ Ram is an Asiatic.

<i>First Form.</i>	<i>Second Form</i>
(1) All Allahabad men are U.P. men. Ram is an Allahabad man. ∴ Ram is a U.P. man.	(1) All Indians are Asiatics. All U.P. men are Indians. ∴ All U.P. men are Asiatics.
(2) All U.P. men are Indians. Ram is a U.P. man. ∴ Ram is an Indian.	(2) All U. P. men are Asiatics. All Allahabad men are U.P. men. ∴ All Allahabad men are Asiatics.
(3) All Indians are Asiatics Ram is an Indian. ∴ Ram is an Asiatic	(3) All Allahabad men are Asiatics. Ram is an Allahabad man. ∴ Ram is an Asiatic.

If we bear in mind that the syllogisms which compose a regular sorities, whether Aristotelian or Goclenian, are always in the first figure, the above rules may be easily proved thus :

(1) If more than one premise be negative, the conclusion of the syllogism in which the first negative premise would occur would necessarily be negative. This would form the suppressed premise in the next syllogism which again would yield a negative conclusion. Thus the suppressed premiss of each succeeding syllogism would be negative and in the syllogism in which the other negative premiss would occur there would be two negative premises, yielding no conclusion whatsoever.

If any premiss in the sorities is negative, the conclusion must be negative and the predicate of the conclusion

(4) *Complex Double*

All M is P, because it is X,
because it is Y.

All S is M, because it is ,
because it is R.

∴ All S is P.

All Hindus are fearless,
because they believe in the
immortality of the soul,
because they believe in the
Vedas.

Ram Singh is Hindu , be-
cause he is Rajput,
because he is a Chauhan.

∴ Ram Singh is fearless.

The progress of thought in an Epicheirema is from episyllogism to prosyllogism. The episyllogism is expressed fully, but the prosyllogisms are enthymatic. This will become clear if we expand one of the Epicheiramas : given above, into its constituent syllogisms. Let us expand the third epicheirema when fully expressed it stands thus :

(1) All S is P

∴ All M is P Episyllogism.

All S is M.

(2) All M is P

∴ All X is P Prosyllogism.

All M is X.

(3) All M is X

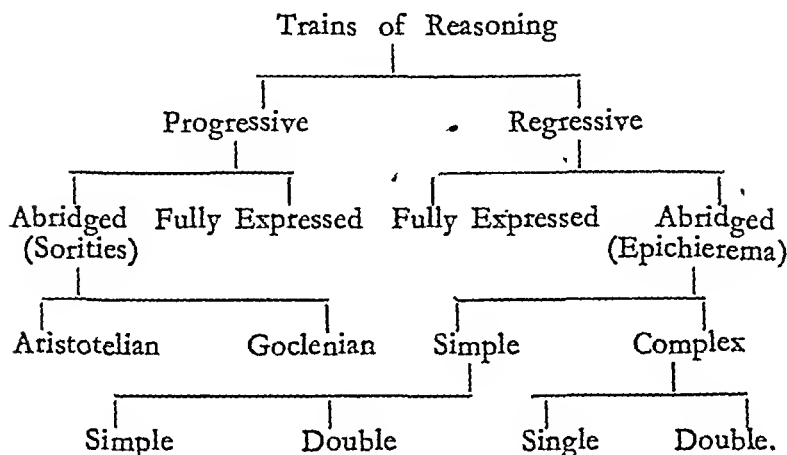
∴ All Y is X Prosyllogism

All M is Y

Thus the Epicheiriema is a Regressive Polysyllogism with one or more prosyllogisms stated enthymatically.

6. Table showing the various kinds of trains of reasoning.

The Trains of Reasoning, as explained above may be shown in the form of a table thus :



7. Hints for solving problems.

1. In testing a train of syllogistic reasoning each syllogism composing the train should be examined. If any syllogism is found to be invalid the whole train is invalid.

2. In testing a Sorities or an Epichierema we should first resolve it into its constituent syllogism and then examine the validity of each. If any one of them is found to be invalid, the whole train of reasoning is invalid.

8. Examples Worked Out.

1. Test the following arguments :—

(a) All X is B, All B is C, No C is D, All D is Y ;
therefore No X is Y.

(b) All M is Y, because All Z is Y and all M is Z;
and all Z is Y, because All S is Z.

(a) This is an Aristotelian Sorities. When fully expressed it stands thus:—

- (1) All B is C (2) No C is D (3) All D is Y
All X is B All X is C No X is D.
∴ All X is C; ∴ No X is D ∴ No X is Y.

The last syllogism involves the fallacy of Illicit Major, since the major term Y is distributed in the conclusion, but not in the premiss. Therefore the whole reasoning is invalid.

(b) This is an epicheirema. When fully expressed it stands thus:—

- (1) All Z is Y, (2) All S is Z
All M is Z, All Y is S
∴ All M is Y. ∴ All Z is Y.

The reasoning is wrong because, the prosyllogism [i.e., (2)] involves the fallacy of Illicit Major.

(2) Construct a valid sorities with a negative premiss.

All criminals are men;

All men are rational;

All rational being can be reformed;

None who can be reformed should be given
capital punishment.

∴ No criminals should be given capital punishment.

EXERCISE XX

1. What is a Sorities? Distinguish between the different forms of sorities and show that in this kind of argument only one premiss can be negative, what is the position of such a premiss? How do you know?

(U.P.B., 1930).

2. Explain the nature of the following forms of syllogism. Give an example of each and expand it into its constituent syllogisms.

(i) Sorities.

(ii) Epicheirema.

(U.P.B., 1931).

3. What is an Epicheirema? Enumerate and illustrate the various types of Epicheirema.

4. Distinguish between Goclenian and Aristotelian Sorities, state and explain the rules of regular sorities.

5. Explain what is meant by the following:—Prosyllogism, Episyllogism, Progressive Sorities, Regressive Sorities, Epicheirema. Give a concrete example of each.

6. What is a Polysyllogism? State its various kinds and give a symbolic examples of each.

CHAPTER XXI

FUNCTION AND VALUE OF SYLLOGISM

1. Is Syllogism the usual form of reasoning ?

Philosophers of the empiricist school like Mill, Herschel, Bain and Whewell have held that our actual inferences are not made in the form of a syllogism. Syllogistic reasoning consists in the application of a universal proposition to a particular case. But all inference is from particulars to particular and not from general to particular. "General propositions," says Mill, are merely registers of such inferences already made, and short formulae for making more. The major premise of a syllogism, consequently, is a formula of this description : and the conclusion is not an inference drawn *from* the formula, but an inference drawn *according to* the formula : the real logical antecedent, or premise, being the particular facts from which the general proposition was collected by induction" (*Logic*, Bk. II Ch. III. §4). Even our earliest inferences are from particulars to particular. The child, for instance, burns his finger once or twice and then he never puts it into fire again. It is because he argues thus : "That fire burnt me and that fire burnt me ; therefore, this fire will also burn me." The real ground of inference is the resemblance between the new and the old cases of fire. The child never thinks of the general principle 'Fire burns'. But as soon as the child recognizes the present object as fire, i.e., as soon as he recognizes it as similar

to the objects which have burnt him previously, he concludes that it would burn.

But though syllogism is not regarded by Mill and his followers as the usual type of reasoning, it is not considered to be altogether useless. Mill clearly recognizes its value as a *test of reasoning*. For he says, "The value . . . of the syllogistic form, and of the rules for using it correctly, does not consist in their being the form and rules according to which our reasonings are necessarily, or even usually made; but in their furnishing us with a mode in which those reasonings may always be represented, and which is admirably calculated, if they are inconclusive, to bring their inconclusiveness to light." (*ibid.*, §5).

On examination we find that this view of the function and value of syllogism is based mainly on the following two considerations:—

(1) That we do mostly reason from particulars to particular.

(2) That the reasonings from particulars to particular are sometimes, though not always, correct.

We may dismiss the first of these considerations on the ground that if a certain type of reasoning is *common*, it does not necessarily imply that it is also *valid*. The question here is not what is the *usual* form of reasoning, but what is the *correct* form of reasoning; not how we *do* mostly, reason but how we *ought* to reason. The question, in other words is not psychological but logical. Logically, we cannot pass from particulars to particular, unless it be through a universal element involved in our reasoning, as we shall see presently.

The second contention is only apparently true. There is no doubt that our reasoning from particulars to particular is often correct. But when this is so, it is because there is a universal element implied in it. Mill admits that the ground of our reasoning from particulars to particular is resemblance or similarity. It is this resemblance or similarity, which is the universal element in our reasoning and which takes the form of a universal major premise when it is expressed fully in the form of a syllogism. When, for example, the child extends his knowledge of the previous objects that burnt him to the new object, which resembles them, he really proceeds on the basis of a universal proposition. He has formed in his mind a general idea of fire, and connected it with the quality of burning. Thus he has arrived at the general proposition. "All objects having the qualities of brilliance and heat, etc. will burn." He applies the general idea of "fire" to the new case by saying "This is an object which has the qualities of brilliance and heat, etc.," and then he concludes "It will burn."

2. Does the syllogism involve a *petitio principii* ?

Mill and his followers have also questioned the validity of syllogistic reasoning. A syllogism, according to them involves a *petitio principii*, because its major premise assumes the conclusion. Mill says, "In every syllogism, considered as an argument to prove the conclusion, there is a *petitio principii*; . . . no reasoning from generals to particulars can as such prove anything: since from a general principle we cannot infer any particulars, but those which the principle itself assumes as known" (*Logic*, Bk. II, Ch. III §2). Thus, in the syllogism 'All men are mortal; Epicurus is a

man; therefore Epicurus is mortal,' the proposition 'All men are mortal already includes the proposition 'Epicurus is mortal'; therefore the former cannot be used to establish the latter.

This objection is certainly valid in the case of an *apparent* syllogism, which has an enumerative universal proposition as its major premise, because such a proposition is established after every particular case coming under it has been examined. Thus the syllogism. "All the chairs in this room are made of teak wood; this is one of them; therefore this is made of teak," involves the fallacy of *petitio principii*, because the particular chair referred to in the conclusion could not have been left unexamined before the major premise was established. But the objection does not hold against a real syllogism, because its *major premise is not a mere summation of facts but an abstract judgment expressing a necessary truth*. Thus in the syllogism, "All men are mortal; Epicurus is a man; therefore Epicurus is mortal," the major premise expresses a necessary connection between 'men' and 'mortality,' which we obtain from an analysis of the *nature* of men, and not from an examination of particular men, though, of course, some particular instances are necessary for analysis. This is the only way in which a real universal proposition can be established. Examination of all the individual cases to which the proposition refers is neither necessary nor useful nor even in most cases, possible. But as soon as a necessary connection between 'men' and mortality is proved, and it is discovered that man *by nature* is mortal, we can safely generalise that 'All men are mortal,' and the proposition may justly

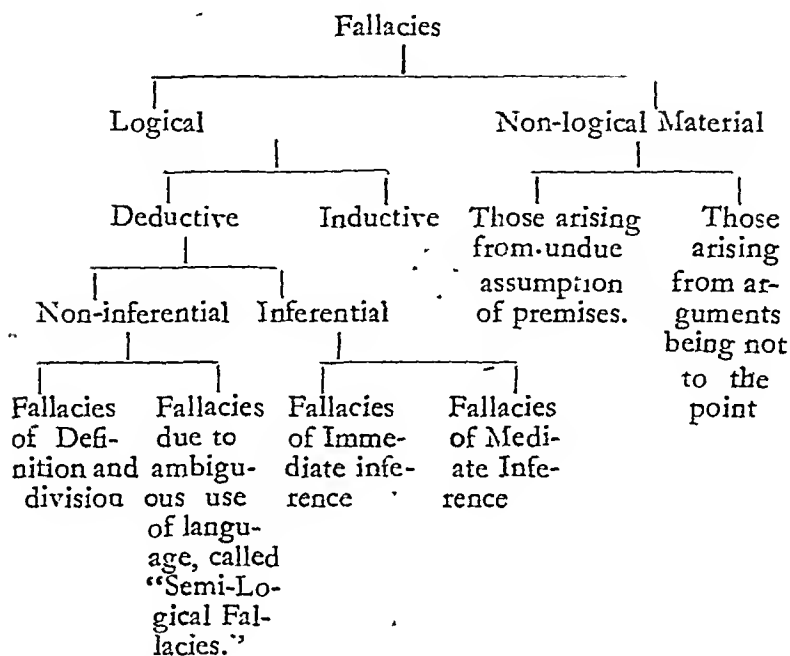
CHAPTER XXII

FALLACIES

1. Definition of Fallacy : its classification.

Fallacies are unsound reasonings, which appear to be correct but are not really so. They are divided into two classes—Logical Fallacies and Material Fallacies. *Logical Fallacies* are those which arise from a violation of the rules of logic. They are sub-divided into those relating to *Deductive* Logic and those relating to *Inductive* Logic. Each of these is again sub-divided into the *Inferential* and *non-inferential* fallacies. Inferential Fallacies are the violations of the rules of inference. Since inference is either mediate or immediate, inferential fallacies may also be sub-divided into *Fallacies of Mediate Inference* and *Fallacies of Immediate Inference*. Fallacies of Mediate Inference arise from the violation of the rules of syllogism; while Fallacies of Immediate inference arise from the transgression of the rules of “The Opposition of propositions,” “Obversion” and “Conversion” etc. *Non-inferential Fallacies* are those that do not relate to inference but to some processes subsidiary to it, for example, the fallacies of Definition, Division, etc. Fallacies arising from ambiguous use of language, known as *Semi-logical fallacies* are also included under Non-inferential fallacies. *Material Fallacies* are those that arise either from the undue assumption of the premises or the irrelevant nature of the conclusion.

The above classification may be illustrated by means of the following table:—



We shall here consider only the fallacies of Deductive Logic and the Material Fallacies.

2. Non-inferential Fallacies—

These arise from a breach of the rules of Definition and Division and from ambiguous use of language.

Fallacies of definition are:—

- (a) Redundant definition;
- (b) Accidental definition;
- (c) Too wide or too narrow definition;
- (d) Circular Definition; and
- (e) Obscure or Figurative definition.
- (f) Negative definition.

Fallacies of Division are:—

- (a) Metaphysical Analysis or Physical Partition
- (b) Cross Division ;
- (c) Too Narrow or Incomplete Division ;
- (d) Too Wide division, and
- (e) Overlapping Division.

These fallacies have already been dealt with under their respective heads.

Fallacies arising from the ambiguous use of language are called **Semi-logical**, because they are not due to a violation of the rules of logic. Whately regards them all as cases of the *ambiguous middle*. Semi-logical fallacies are the following:—

- (1) Fallacy of Equivocation ;
- (2) Fallacy of Figure of Speech or Fallacy of Paronymous Terms ;
- (3) Fallacy of Ambhigology ;
- (4) Fallacy of Accent ;
- (5) Fallacy of Accident ;
- (6) Converse fallacy of Accident ;
- (7) Fallacy of Composition ;
- (8) Fallacy of Division ;
- (9) Fallacy of Many Questions.

3. Detailed Description of Semi-logical Fallacies:—

(1) Fallacy of Equivocation.

This is a very common fallacy. *It arises whenever the same term is used in two different senses* in the premises. The fallacy being similar to the fallacy of Four Terms has been treated fully in the chapter on Syllogism. (Ch. XV. Sec. 4).

(2) Fallacy of Figure of Speech or Fallacy of Paronymous Terms.

This fallacy is committed *when paronymous terms, i.e., two words which are derived from the same root but are of different grammatical types such as adjective, verb, etc., are used as if they bear the same meaning.* For example.

All *creditors* will be deceived;
 This man is a man of *credit*;
 ∴ This man will be deceived.

(The words *creditor* and *a man of credit* do not have the same meaning. The former means "The man to whom credit is due," and the latter, "the man who has gained the confidence of others).

No *designing* person should be trusted.
 Engravers are by profession *designers*.
 ∴ Engravers ought not to be trusted.

(*Designing* and *designers* are quite different in meaning).

(3) Fallacy of Amphibology.

The fallacy of amphibology consists in the ambiguous use of a sentence which admits of double construction. This fallacy, it is said, offered a kind of refuge to the ancient oracles that professed to predict the future. Thus the prophesy in Shakespeare, "The Duke yet lives that Henry shall depose" may mean either that Henry shall depose the Duke, or that the Duke shall depose Henry. Similarly "Alexander Darius will conquer" may mean either that Alexander will conquer Darius or that Darius will conquer Alexander

(4) Fallacy of Accent.

The fallacy of accent arises from shifting the accent or emphasis from the word to which it properly belongs to another

word in a sentence. For example the meaning of the sentence "Thou shalt not bear false witness against thy neighbour" may easily be changed by shifting emphasis from one word to another. It will have one meaning if the word 'thou' is emphasised and a different meaning if the words 'false' 'against' 'thy' or 'neighbour' are emphasised.

(5) Fallacy of Accident.

This fallacy lies in taking what is true as a general rule as true under special conditions or accidental circumstances. In all such arguments the middle term is taken without any condition in the major premise and under certain conditions in the minor premise. Examples :

- (1) Whoever kills another should suffer death,
A soldier kills his enemy;
∴ A soldier should suffer death.
- (2) Alcohol is poison;
The doctor has prescribed alcohol.
∴ The doctor has prescribed poison.
- (3) He who calls you a man speaks truly;
He who calls you a fool, calls you a man;
∴ He who calls you a fool speaks truly.
- (4) What we eat grow in the fields; (Jevous)
Loaves of bread are what we eat;
Loaves of bread grow in the fields.

The following is an interesting example of the Fallacy of Accident, cited by Subrahmanyam¹ from DeMorgans book :—

A servant who was roasting a stark for his master was prevailed upon by his sweetheart to cut off a leg for her to eat. When the bird came upon the table, the master desired to know what was become of the other leg. The man answered that starks had never more than one leg. The master, very angry, but determined to strike his servant dumb before he punished him, took him next day into the

fields where they saw storks, standing each on one leg, as storks do. The servant turned triumphantly to his master : On which the latter shouted, and the birds put down their other legs and flew away. " Ah Sir," said the servant, " You did not shout to the stork at dinner yesterday. If you had done so, he would have shown his other leg too " (Subramanyam : *Logic—Deductive*, p. 401).

The fallacy here consists in predicating of *roasted* storks what is true of storks in general.

(6) Converse Fallacy of Accident.

This fallacy consists in *arguing from a special case to a general one*, i.e., in assuming that what is true of a thing under special conditions or circumstances will be true of it generally or in normal conditions as well. Examples :

(1) " Staying in bed is good for a person's health when he is unwell, therefore it is normally so " (Latta and Macbeth).

(2) The doctors often prescribe liquors. Therefore they cannot be injurious to health.

(3) Students that always depend upon others for help should never be assisted. Therefore no students should be assisted.

(4) Adulterated milk is not substantial food, therefore no milk is substantial food.

(7) Fallacy of Composition.

This fallacy is committed when *we pass from the distributive to the collective use of a term*, i.e., when we affirm of a whole class taken collectively something which holds true of its parts when taken separately or distributively.

Examples :—

(1) " One can live without food (collective) for one can live without bread or potatoes or porridge or any other kind of food distributive. ")

(2) "Six and seven (separately) are even and uneven. (*Latta and Macbeth*) thirteen is six and seven. Therefore thirteen is even and uneven (collective)." (*Fowler*.)

(3) Every incident in this story is very natural and probable; therefore, the story itself is natural and probable.

(4) Of the five members of the jury, not one is intelligent enough to judge correctly; therefore the jury cannot judge correctly.

(8) Fallacy of Division.

This fallacy consists in *passing from the collective to the distributive* use of a term, i.e., in affirming that what is true of a class as a whole is true of the parts taken separately or distributively. Examples :

(1) "All the angles of a triangle (collective) are equal to two right angles; angle ABC is an angle of a triangle (distributive); therefore angle ABC is equal to two right angles".

(2) All the works of Shakespeare (collective) cannot be read in a day; therefore the play of Hamlet, which is a work of Shakespeare cannot be read in a day.

(3) I remember what I have read (collective); I have read every line of Shakespeare; therefore, I remember every line of Shakespeare.

(4) All the students of this college (collective) are sufficient to pull down this tree. You are a student of this college (distributive); therefore you are sufficient to pull down this tree.

(5) Indians are a peace-loving nation; Mr. X. is an Indian; therefore Mr. X is peace-loving.

(6) The committee convicted him; you are a member of the committee; therefore you convicted him.

(9) Fallacy of Many Questions.

The fallacy of many questions consists in *confusing two or more questions into one and demanding a plain answer to it in 'yes' or 'no'*. For example: "Have you left off beating your

mother?" It implies the two questions (1) were you in the habit of beating your mother? If so, have you now left it off? Each question should be answered in term. But the fallacy consists in demanding an answer to both at once in a simple affirmative or a simple negative. If you say 'yes,' it would imply that you are not beating your mother now, but that you have been in that habit before. If you say 'No,' it would imply that you are still in the habit of beating her. In either case the answer would imply something which may not be actually intended. The fallacy is sometimes used by lawyers in their cross-examination of witnesses so that the answer 'yes' or 'no' which they give for a part of the question may be taken as an answer for the whole. The question said to have been asked by Charles II to the first member of the royal society "why does not a dead fish add to the weight of a vessel of water, while a live fish does?" is also an example of this fallacy for it involves two questions (1) Is it a fact, and (2) If so, how do you account for it?

4. Material Fallacies.

Material fallacies are not due to the violation of any of the rules of reasoning. They *relate to the subject matter of reasoning*, and are of two kinds:—

(1) Those arising from *Undue Assumption of the Premises*, and

(2) Those arising from the argument being not to the point or *Ignoratio Elenchi*.

(1) **Fallacy of Undue Assumption.** This may again be divided into two kinds, viz., (a) *Falsity of a Premise* and (b) *Petitio Principii*.

(a) Falsity of a Premise

This fallacy is committed when a false premise is used to prove the conclusion. For example.

(1) All flying animals are birds ;

Bats are flying animals,

∴ Bats are birds.

Here the major premise is false.

(2) All Nazis are dangerous.

All Germans are Nazis.

∴ All Germans are dangerous.

Here the minor premise is false.

(b) Petitio Principii or Begging the Question.

This fallacy consists in *assuming as a premise in some form or other either the very proposition to be proved or some other proposition which can be proved only by means of the latter*. The principal forms in which the fallacy occurs are the following :—

(i) Simple Petitio Principii, *when the conclusion simply repeats the premise in different words*. For example.

(a) Opium produces sleep because it is soporific.

(b) Glass is transparent, because you can see through it.

(c) I was absent, because I failed to come.

(d) This law is useful, because it will do a great service to the people.

(e) You ought to give alms, because it is your duty to be charitable.

(f) The volume of a body diminishes, when it is cooled, because the molecules then become closer.

The fallacy in the above instances is committed in a single step of inferenecs. But the fallacy may also be committed in single words if what is known as **a question**

begging epithet is used. For example, the fallacy is committed when we describe a change as 'progress' or a revolution as a 'rebellion.'

(ii) **Complex Petitio Principii or Arguing in a Circle**, when an argument involves a *chain of reasoning in which one of two propositions is used in term to prove the other*. The assumption of the conclusion as a premise is separated from its statement as conclusion by several steps so as to make its detection rather difficult. Examples :—

(a)	A is B	C is B
	C is A	A is C
	∴ C is B	∴ A is B

(b) God exists, because the Vedas tell us so, and what the Vedas say must be true, because they are of divine origin.

(c) The volume of a body diminishes if cold is applied to it, because its molecules become closer when cold is applied to it, and that happens, because cold diminishes the volume of a body.

(2) Ignoratio Elenchi.

The fallacy is committed when ever we *argue beside the point*. 'Ignoratio Elenchi' means 'ignorance of the nature of refutation'. If we want to refute a proposition, we should establish it contradictory. But if instead of establishing its contradictory we establish something else and claim that we have refuted the proposition, we only show our ignorance of the real nature of refutation.

The fallacy of Ignoratio Elenchi appears in the following forms :—

(a) Argumentum ad hominem.

This fallacy arises when *our arguments are directed to the opponent and not to the point at issue*, viz., when they have a reference to his character, circumstances or past conduct and opinions and do not bear directly on the real question. The fallacy is committed for example, when a people laugh on a late riser speaking of early rising in glowing terms or when a patient advised by the physician to give up smoking ignores his advice on the ground that the physician himself is a smoker, or when a thief is accused of having committed a particular theft not because there is direct evidence to support this but because he is a thief, or a man's arguments in favour of communism are supposed to be invalid because he was a socialist sometimes before.

(b) Argumentum ad populum.

This fallacy consists in *appealing to the passion, pity and fondly cherished opinions of the people rather than to their reason*. The fallacy is commonly resorted to by orators, who try to win the sympathy of the people for their cause by exciting their feelings. The argument against Darwins theory of evolution that its acceptance amounts to the belief that our ancestors were apes, is an example of the fallacy. We do not reject the theory on the basis of reason, but because it hurts our feelings. A thief, who instead of pleading his innocence begins to weep in the court also commits the same fallacy, for he appeals to the judge's feeling, not to his judgment.

(c) Argumentum ad verecundiam.

Here the *appeal is made to the sentiment of reverence for some respected authority*. Thus the fallacy is committed if we condemn the theory of Evolution, because it does not have the support of the Bible or if we accept it just because it was propounded by a great scientist like Darwin.

(d) Argumentum ad ignorantiam.

This fallacy is committed if *the ignorance of the people or the opponent is taken as a ground of proof*. We may throw the burden of disproof of the point we want to establish on our opponent and if he is not able to disprove we may take it as established, or we may prove some other point which is like it trusting that the ignorance of the opponent will prevent him from noticing the difference. In many other forms the ignorance of the hearer may be the main reason why he accepts our statement which is not really proved. For examples, one may say that the first battle of Panipat was fought on 3rd January 1245 A.D. or that there are 5340678953 stars in the sky trusting that the statement will be accepted because the listeners are themselves ignorant of the subject and have no means by which to disprove it. Similarly a student of Logic may silence his opponent, who has not studied by Logic by saying that he is committing the fallacy of *bysteron proteron* or a doctor who is unable to diagnose a disease may try to satisfy the patient by telling him a big, and may be, a fictitious name of it.

(e) Argumentum ad baculum.

This consists in employing *force instead of reasoning to convince ones opponent*. It has therefore been described as

the *argument of the cudgel* or the argument of the wolf to the lamb. The argument is commonly resorted to in politics by a stronger nation against a weaker nation. Hitler for instance used the argument when he pleaded for economic or territorial rights for Germany in the neighbouring countries after massing troops and tanks on their boarder.

(f) Shifting the ground.

This fallacy occurs *when a man failing to maintain his original position shifts the ground of the argument*. For example, a drunkard finding it difficult to maintain that wine is good in itself may covertly change the question at issue by saying that it is good because it makes one forget the sorrows and anxieties of the world; or a man finding that his criticism against the character of an individual does not stand, may turn it upon his family or community.

(g) Non-Sequitur or Fallacy of Consequent.

This fallacy occurs when the consequent does not in any way follow from the antecedent, i.e., when something is inferred from any other thing which has no logical connection with it. Example.

(1) You must have seen the Taj, because you went to Agra.

(2) He must be a great scholar, because he has a big library.

(3) He must be a rich man, because he is always well dressed.

(h) Hysteron Proteron.

This is commonly known as *placing the cart before the horse*. It is changing the logical order of events or things. For example the fallacy is committed if instead of saying,

a man frowns because he is angry we say, he is angry because he frowns or if instead of saying there is light because the sun is up, we say, the sun is up because there is light.

(i) Non-Causa Pro Causa or False cause.

The fallacy occurs when we assume without sufficient proof that one thing is the cause of another. A common form of this fallacy is what is known as *Past hoc ergo propter hoc*, that is, to assume that something is the cause of another simply because the one is followed by the other. There is an inductive fallacy.

5. Examples Worked Out.

1. Examine the following arguments :—

(a) Water is a liquid.

Ice is water.

∴ Ice is a liquid.

Answer : Here 'water' has been used in the general sense in the major premise and in a special sense in the minor premise. In the major premise it is used without any condition, but in the minor premise it is used as subject to the condition that it is frozen. Hence the argument involves the *fallacy of accident*.

(b) All the trees of the forest make a thick shade ;

This is a tree of the forest ;

∴ This tree makes a thick shade.

Answer : Here "the trees of the forest" is used collectively in the major premise but distributively in the minor premise. Hence the argument involves the *Fallacy of Division*.

(c) Mahatma Gandhi is more capable of dealing with the present situation in India than any other leader of the country. Therefore we should accept him as our sole guide and be indifferent to the collective voice of the other leaders.

(d) This act is wrong, because it is opposed to sound moral principles.

Answer.—The argument involves the fallacy of *Petitio Principii* because the conclusion simply repeats the premise in different words.

(e) War cannot be condemned as an evil. Does not the Gita advocate war for a righteous cause?

Answer.—The argument is an instance of the fallacy of *Argumentum ad verecundiam* for it rests on an appeal to our feeling of reverence for Gita.

(f) Ram must have met Govind in Bombay yesterday for he also went there yesterday.

Answer.—The conclusion does not in any way follow from the premises. There is no necessary connection between two men going to Bombay on the same day and their meeting each other. Therefore, the argument involves the fallacy of *Non-Sequitur*.

(g) What is twice two and three?

Answer.—This involves the fallacy of *amphibology*, for the construction of the sentence is ambiguous 'Twice two and three' may be interpreted to mean either $2 \times 2 + 3$ or $2(2 + 3)$.

Exercise XII

1. Examine the following arguments:—

(a) All these men are quite sufficient for the job. You are one of them. Therefore you are quite sufficient for the job.

(b) The human soul must be diffused over the whole body, because it animates every part of it.

(c) Ram Murti might will have been sent to quell the riot, since he is more than a match for the most powerful man.

(d) The Congress men are justifying office-acceptance today. Did they not organise mass civil disobedience only a few years ago?

(e) 'Your argument is fallacious.'

'Why?'

'It involves the fallacy of *petitio principii*?

'What is that?'

'You will learn it when you go to the Intermediate class and study Logic.'

(f) He must know a great deal, for he says little.

(g) To allow every man an undoubted freedom of speech is advantageous to the state, for it is highly conducive to the interest of the community that each individual should enjoy an unlimited liberty of expressing his sentiments.

2. Examine the following arguments:—

(a) Did Sir Stafford Cripps promise a National Government at the beginning of his mission at New Delhi, early in March last?

Mr. Louis Fischer reverts to the question in his reply to Mr. Graham Spry's Contribution in the New York "Nation" of November, 1942, in which Mr. Spry denied that such a promise was made by Cripps.

Mr. Fischer quotes Maulana Azad, Pandit Nehru and Mr. Rajagopalachari in defence of his thesis and asks, "Did they all lie?"—*Hindustan Times*, Jan. 11, 1943.

(b) "His Excellency the Governor of Bombay arrived here by 'special train,'" states a news agency message from Dharwar . . . There are railway advertisements appealing to the public to travel only when they must and depicting through pictures that by denying oneself the pleasure of travelling one enables the railways to transport a tank or some other war material for the defence of services. Are all these self denying ordinances applicable only to the long suffering people?"—*Hindustan Times*, Jan. 24, 1943.

(c) Why does the Intermediate Board pass only a fixed percentage of students every year?

(d) "How do you do?" "Do what?" "I mean, how do you feel?" "How do I feel, with my fingers, of course, but I can see very well." "No, no. I mean how do you find yourself?" "Then why did you not

say so? I never exactly noticed, but I will tell you next time I *lose* myself"—*Dr. Minto*

(e) Americans are enterprising. James is an American. Therefore, he is enterprising.

(f) He is studying fine arts. Therefore, he is artful.

(g) A student says to his teachers who punishes him for a fault, 'You ought to return good for evil.' (P. U. 1933).

3. Test the following arguments :—

(a) "What? The sun does not revolve round the earth? Do you mean to say that the celebrated astronomer Ptolemy, who supported this theory was a fool?"

"Yes the theory is wrong, because Copernicus contradicted it."

(b) He must be an adulterer, for he is a showy dresser, and is seen about at nights.

(c) Physician heal thyself.

(d) "Gentlemen, why do you allow yourself to be led away by the western civilization? You who are the sons of a proud nation, whose forefathers were scientists, philosophers and kings when the westerners were still roaming about in the forests."

(e) I accomplished whatever I choose to do, because I never choose to do except what I can accomplish.

4. Examine the following arguments :—

(a) To call you an animal is to speak truly.

To call you a monkey is to call you an animal.

∴ To call you a monkey is to speak truly.

(b) The counsel, cross examining a witness, said "were you not enraged at the abusive language which the accused used for my client?"

(c) "A showman advertised that children of both sexes were admitted free, but he then charged admission to boys and girls saying that neither of them were children of both sexes."—(A.U. 1927)

(d) "The fellows of the Royal Society have made the greatest discoveries in science; A, B and C are Fellows of the Royal Society; therefore A, B, and C have made the greatest discoveries of science.

(e) You should not run to the college just now.

(f) Moral laws must be obeyed because they are made by God. utB why did God make them? Because they are moral.

(g) Your grandfather would die of shame, he knew you hold such beliefs.

(h) Radium is a rare metal, for few people can procure even a small quantity of it.

(i) We ought not to go to war, for it is wrong to shed blood. (P. U. 1928).

(j) He spoke to his sons saying 'saddle me the ass' and they saddled *him*.

CHAPTER XXIII

ANUMAN (INFERENCE)

1. Pramana and its Kinds.

In Indian Philosophy the *Nyāya*¹ and *vaisheshika*² systems of Gautama and Kanāda are supposed to constitute what is generally known as 'Indian Logic,' because they treat the logical doctrine in greater detail than the other systems. Logic is regarded as a means to the attainment of the life's ideal i.e., *Moksa*³. Moksa cannot be attained without right knowledge or *Pramā*⁴. The means through which right knowledge may be obtained are known as *Pramānas*⁵. The *Pramanas* are four in kind, viz., (1) *Pratyakṣa*⁶ or Perception, (2) *Anuman*⁷ or Inference, (3) *Upamān*⁸ or Analogy and (4) *Sabda*⁹ or testimony, But of these facit Anuman alone is exclusively logical in treatment.

2. Anuman.

Anumān is the process of ascertaining not directly by perception but through the instrumentality of a mark that a thing possesses a certain character. It is an argument from sign, as aided by remembrance. It derives a conclusion from the perception of a sign which indicates the presence of something, known in the past to have been invariably associated with it, but falling outside the scope of our vision at the moment. For

1 न्याय 2 वैशेषिक 3 मोक्ष 4 प्रमा 5 प्रमाण 6 प्रत्यक्ष.
7 अनुमान 8 उपमान 9 शब्द

example, on seeing smoke rising from a hill we remember that smoke has always been associated with fire and conclude that there is fire on the hill. The sign, (smoke) which indicates the presence of something which is not directly perceived (fire) is technically called *linga*¹ or *sādhaka*² or *Vyāpya*³ (middle term) the property or thing the presence of which is thus indicated (fire) is called *linga*⁴ or *sādhya*⁵ or *vyāpaka*⁶ (major term); the thing or place where the *linga* is observed and the existence of the *lingi* is established (hill) is called *pakṣa*⁷ (minor term); the statement of the presence of the *linga* in the *pakṣa* (there is smoke on the hill) is called *Hetu*⁸ (minor premise); the statement of invariable concomitance between the *linga* and the *lingi* (wherever there is smoke there is fire) is called *Vyāpti*⁹ (major premise); the statement that the existence of the *lingi* is established in the *pakṣa* (therefore, there is fire on the hill) is called *igamanna*¹⁰ (conclusion).

A complete Anumān has five anayavas (parts). They are :—

- | | |
|---|--|
| 1. <i>Pratijñā</i> ¹¹ (Enunciation)—
the statement of what
is to be demonstrated. | } <i>e.g.</i>
There is fire on the hill. |
| 2. <i>Hetu</i> ¹² (Reason)—the state-
ment of the sign by means
of which the existence of
the <i>sādhya</i> is established. | } <i>e.g.</i>
Because there is smoke
on the hill. |
| 3. <i>Udaharan</i> ¹³ (Example)—
the statement of <i>vyāpti</i>
or generalisation on which
the inference is based
with an example. | } <i>e.g.</i>
Wherever there is smoke
there is fire, as in a
kitchen. |

¹ लिङ्ग. ² साधक. ³ व्याप्य. ⁴ लिङ्गी. ⁵ साध्य. ⁶ व्यापक. ⁷ पक्ष.

⁸ हेतु. ⁹ व्याप्ति. ¹⁰ निगमन. ¹¹ प्रतिज्ञा. ¹² हेतु. ¹³ उदाहरण.

4. *Upanaya*¹ (Application)— } *e.g.*
 the statement in which } The smoke on the hill
 the general rule is ap- } is the same kind of
 plied to the pakṣa or } smoke as is associated
 the particular case under } with fire.
 consideration. }
5. *Nigamana*² (Conclusion)— } *e.g.*
 the statement that the } Therefore there is fire
 existence of the sādhyā } on the hill.
 is established in the pakṣa }

The order of propositions in Anuman is more natural than in the Aristotelian syllogism. The pratijna sets forth at the very beginning the thesis to be proved (there is fire on the hill) and provides a necessary safe guard against arguing beside the point by rivetting our attention upon it to the exclusion of anything else. It points out clearly the pakṣa or the minor term (hill) which is under consideration and the sādhyā or major term (fire), the existence of which in the pakṣa is required to be established. The next natural step is to state the mark or linga or sādhak or the middle term (smoke), the presence of which in the pakṣa leads us to infer the sādhyā or, in other words, to give the hetu or reason for making the statement in the pratijnā. The third step, gives the real basis of the inference in the shape of vyāpti, or a general statement of connection between the sādhak and the sādhyā, followed by an example. The mention of the example reminds us of the fact that the inference is both deductive and inductive and that the generalisation is made on the basis of particular experiences. The fourth step upanaya, makes the actual process of inference which was so far present in the mind explicit by stating that the general rule is applicable to the present case. Lastly

¹ उपनय.

² निगमन.

when all the conditions are fulfilled the conclusion establishes what is put forth tentatively in the Pratijnā.

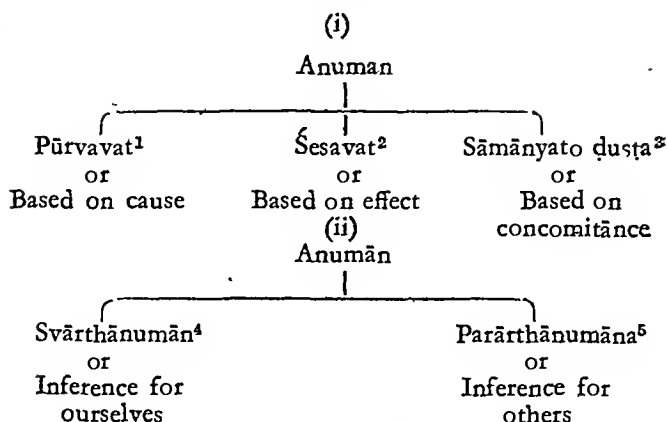
The five membered syllogism is usually accepted by all Naiyāyikās and Vaisesikas. But there are logicians according to whom the number can be reduced to three or even to two. The Vedāntins and the Mimāṃsaks accept only three members, viz., the first three or the last three, because the conclusion is a restatement of the first proposition and the fourth member, Upanaya, is a repetition of the second. The Buddhists and the Jains accept only two members, viz., the pratijnā and the hetu, thus holding that the vyāpti is implied in the hetu. On this view it is enough to say there is fire on the hill because there is smoke on it. It may, however, be said in defence of the five-membered syllogism that although the necessary parts of an inference are only three, from the point of view of the real purpose of Anuman,, which is to convince the opponents of the truth of the conclusion one has reached, all the five parts are necessary.

Though, however, there are differences among logicians with regard to the actual number of the avayavas in an anumān they are agreed that the two essential parts of anumān are the hetu and the vyāpti and the conclusion can neither be drawn from the hetu nor from the vyapti taken separately but from both of them taken together. The process of considering the hetu and the vyapti in relation to each other is called *parāmarśa*.¹

3. Kinds of Anuman.

Anuman is divided according to two different principles of division as follows :—

¹ परामर्श.



(i) Anuman : Purvavat, Seavat and Samanya to-dusta.

Pūrvavat Anumān is an inference from the cause to the effect, as for example, we infer that rainfall may be expected when we see the clouds threaten in the sky. It is also used to include, besides the inference from cause, the inference based on past experience.

Sesavat Anumān is an inference from the effect to the cause as for example, when we see a river in flood we infer that there was rain somewhere up in the course. It is also used to include the inference based on “*śeṣa*” (remainder or residue) or elimination, e.g., sound is either a substance or a quality or an action, it is neither a substance nor an action; therefore it must be a quality. It is like a disjunctive syllogism in which we affirm one alternative by denying the others.

¹ पूर्ववत्. ² शेषवत्. ³ सामान्यतो दृष्ट. ⁴ स्वार्थानुमान. ⁵ परार्थानुमान.

Sāmānyatoḍuṣṭa anumān is an inference, which is based not so much on causation, as on uniformity of experience or on the observation of the *samānya* or common nature of things, e.g., colour is a quality and resides in a substance; therefore, *buddhi* (intelligence) which is also a quality must also reside in a substance.

(ii) Anuman : Svārtha and Parārtha.

This is a psychological classification based on the purpose which an inference serves. It may be used for the acquirement of knowledge for the self or for the demonstration of a known truth to others. In the former case it is called Svārthānumān, while in the latter case it is called Parārthānumān.

Svārthānumān is composed of the following steps :—

(a) Formulation of a *vyāpti* or general proposition (inductively) by repeated observation of the co-presence of two things. For example by repeatedly observing that smoke is accompanied by fire, we arrive at the generalisation “Wherever there is smoke, there is fire.”

(b) The observation of the *linga* in a *pakṣa*, e.g., the observation of a streak of smoke issuing from a hill.

(c) The remembrance of the *vyāpti*, for example, the remembrance of the general proposition that wherever there is smoke there is fire, occasioned by the perception of smoke on the hill.

(d) The conclusion, e.g., there is fire on the hill.

Parārthānumān follows Svārthānumān and is based on it. For, before we proceed to convince somebody of the truth of a certain conclusion, we must ourselves be sure of it. Svārthānumān is informal and in it there is greater

CHAPTER XXIV

HETVABHAS (FALLACIOUS REASONING)

1. Kinds of Hetvabhas.

Hetvābhās¹ implies a *hetu* or reason which appears as valid but is not really so. The author of Tarkasangraha mentions five kinds of Hetvābhās, namely, Savyabhichār² (discrepant), *Viruddha*³ (contradictory), *Satpratipaksa*⁴ (counterbalanced), *Asiddha*⁵ (inconclusive) and *Bādhita*⁶ (absurd).

2. Savyabhichar Hetu.

The Savyabhichār Hetu is a hetu involving vyabhi-chāra or discrepancy in the concomitance of the linga and the sādhya. The linga is not invariably concomitant with either the presence or the absence of the sādhya exclusively, but it is concomitant sometimes with the sādhya and sometimes with the absence of the sādhya. To illustrate

All objects which cannot be touched are eternal.

Sound is an object which cannot be touched.

Therefore sound is eternal.

Here the linga 'objects which cannot be touched' is not necessarily related to the sādhya, i.e., the eternal objects, for all objects which cannot be touched are not eternal. Therefore, we cannot argue that sound is eternal because it cannot be touched. Since in savyabhichār hetu the linga co-exists both with the presence and the absence of

¹ हेत्वभास. ² संव्यभिचारी. ³ विरुद्ध. ⁴ सत्प्रतिपक्ष. ⁵ असिद्ध.

⁶ बाधित

the sādhyā, it is also called *anaikāntaka*⁷ or an inconsistent concomitant of the sādhyā.

The Savyabhichāra hetu is of three kinds, namely, the *Sādhārana*,⁸ the *Asādhārana*,⁹ and *Anupasambhāri*!¹⁰.

(1) The Sādhārana (too wide) hetu¹¹ is that which co-exists both (with the presence of the sādhyā, and with its absence viz., with both the sapakṣa (similar) and the vipakṣa (contrary) instances to illustrate, "the hill is fiery, because it is knowable." The reason given viz., knowability is found to coexist with things having fire e.g., Kitchen as well as with things not having fire, e.g., lake, and hence it is invalid.

(2) Asādhārana (too narrow) hetu is that which is found neither in the sapakṣa nor in the vipakṣa instances, because it is a peculiar characteristic of the pakṣa and exists in it alone, e.g., 'sound is eternal because it is audible.' Here the hetu 'audibility' is a peculiar characteristic of sound. It is found in no other sapakṣa instance. God, self and ether, etc. are eternal objects and therefore sapakṣa, but audibility cannot be predicated of any of them. Therefore the vyapti between eternity and audibility implied in the above argument is untenable.

(3) The Anupasamhāri (non-exclusive) hetu is that which having all things as its pakṣa, does not allow sapakṣa or vipakṣa instances, e.g., "All things are transitory because

⁷ अनैकान्तिक. ⁸ साधारण. ⁹ असाधारण. ¹⁰ अनुपसंहारी.

¹¹ 'Hetu' has a somewhat loose connotation in Indian Logic. It is sometimes used for the minor premise and sometimes for the līnga or the middle term. In the present context it is used in the latter sense.

they are known," Here the 'paksa' 'all things' is all-inclusive. Hence sapaksa and vipaksa instances are not possible.

3. The Viruddha Hetu.

The Viruddha (self-contradictory) hetu is that which disproves the very proposition which it is intended to prove, because instead of being an invariable concomitant of the presence of the sādhyā, it is an invariable concomitant of the absence of the sādhyā. For example the fallacy is committed if we argue, "Sound is eternal, because it is caused." The hetu 'caused' does not prove the eternity of the sound but its non-eternity, because it is invariably connected with things that are non-eternal and not with things that are eternal. Similarly if we argue that water is cool because it is put on fire, it would be a case of viruddha. The distinction between savyabhichāra hetu and viruddha hetu is that while the former fails to prove the conclusion the latter disproves it.

4. The Satpratipaksa Hetu.

A hetu is called Satpratipaksa (counterbalanced) when the sādhyā which it tries to establish is contradicted by another hetu. Thus, for example, the inference "sound is eternal, because it is audible," is contradicted by the inference "sound is non-eternal, because it is caused." The distinction between *viruddha* hetu and *satprati-paksa* hetu is that while in the former the existence of the sādhyā is contradicted by the very hetu, which is meant to prove it, in the latter the existence of the sādhyā is contradicted by some other hetu.

5. The Asiddha Hetu.

The Asiddha Hetu is that which employs a hetu or middle term which is not yet established and which requires a proof like the sādhyā, which it tries to establish. The asiddha hetu is of three kinds, namely Asrayāsiddha,¹ Svarupāsiddha² and Vyāpyatvāsiddha³. (i) The Asrayāsiddha hetu is that which is invalid because the āsraya or pakṣa in which it is said to reside is itself unreal. For example, 'the sākṣ-lotus is fragrant because it has *lotusness* in it like a natural lotus.' Here the middle term 'lotusness' has no āsraya or *locus standi*, because the sky-lotus in which it is said to reside is itself imaginary, (ii) The Svarupāsiddha hetu is that which by its very nature (svarup) cannot abide in the pakṣa. For instance, 'the lake is fiery because it is smoky'. Here though the pakṣa 'lake' is real but the hetu 'smoke' is inconclusive, because it cannot by its very nature abide in it.

(iii) The Vyāpyatvāsiddha hetu is that which is lacking in vyāpti. Here the pakṣa is real and the hetu given is also present in the pakṣa, but the vyāpti is not universally true. For example, in the inference 'the hill has smoke, because it has fire, and whatever has fire has smoke,' the vyāpti 'whatever has fire has smoke' is not universally true. It is true only under the condition or upādhi, that 'fire is accompanied with wet fuel' and wherever this condition is not present it is not true, as for example, in a 'bulb' or a red hot iron.'

6. The Badhita Hetu.

Bādhitā Hetu means a contradicted hetu. The contradiction lies in the fact that the non-existence of the sādhyā

¹ आश्रयासिद्ध

² स्वरूपासिद्ध

³ व्याप्यत्वासिद्ध

which it is intended to establish is proved by means of some other pramána or source of knowledge. This may be illustrated by the argument. 'Fire is *cold* because it is a substance', Here the non-existence of the sadhya (coldness), which the hetu (substance) tries to establish is contradicted by direct perception. On touching the fire we find that it is not only not cold but hot. The fallacy of satpratipaksa is different from bádhitá in this that while in the former one inference is contradicted by another inference in the latter an inference is contradicted by some other source of knowledge.

